DIESEL PROGRESS

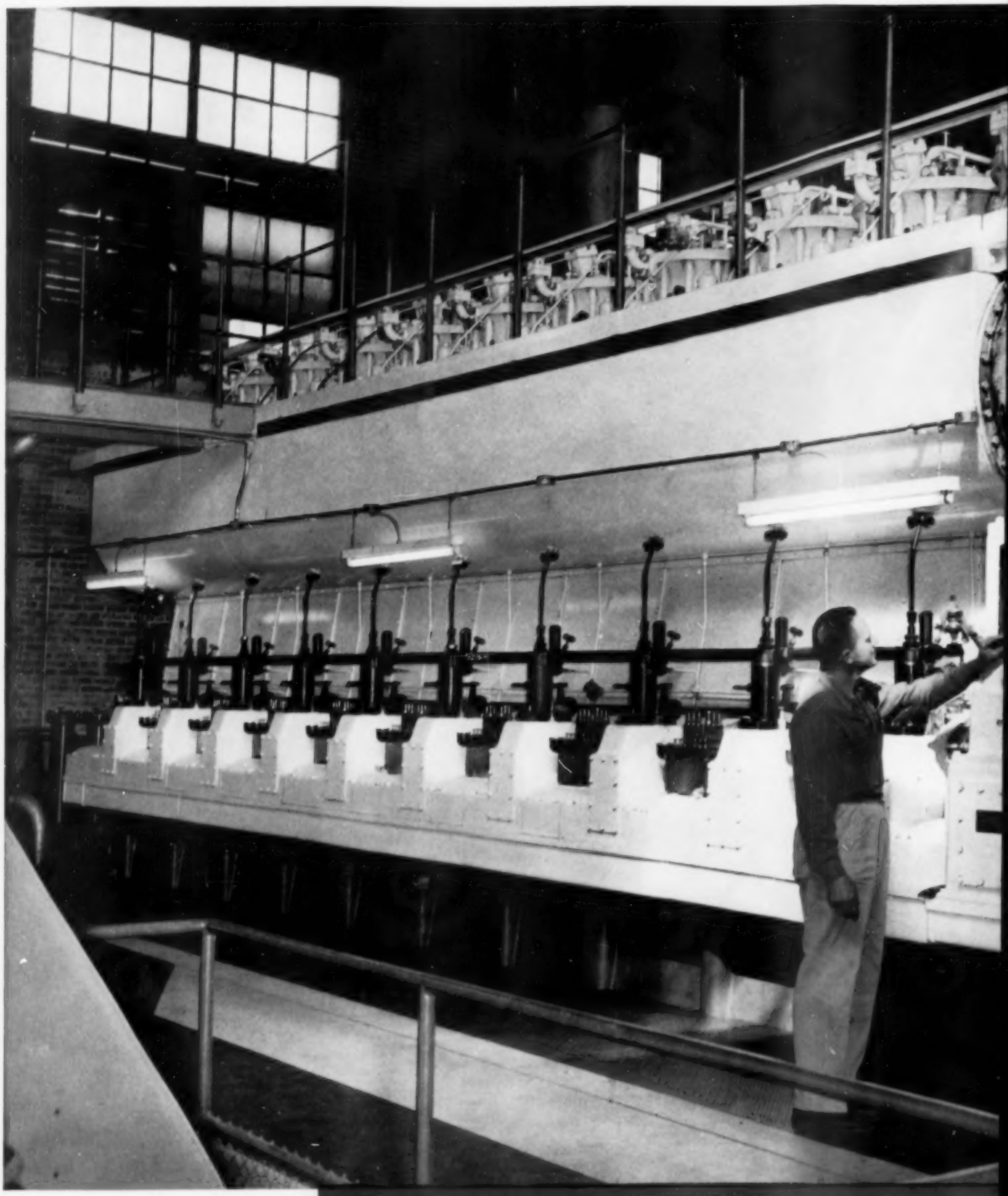
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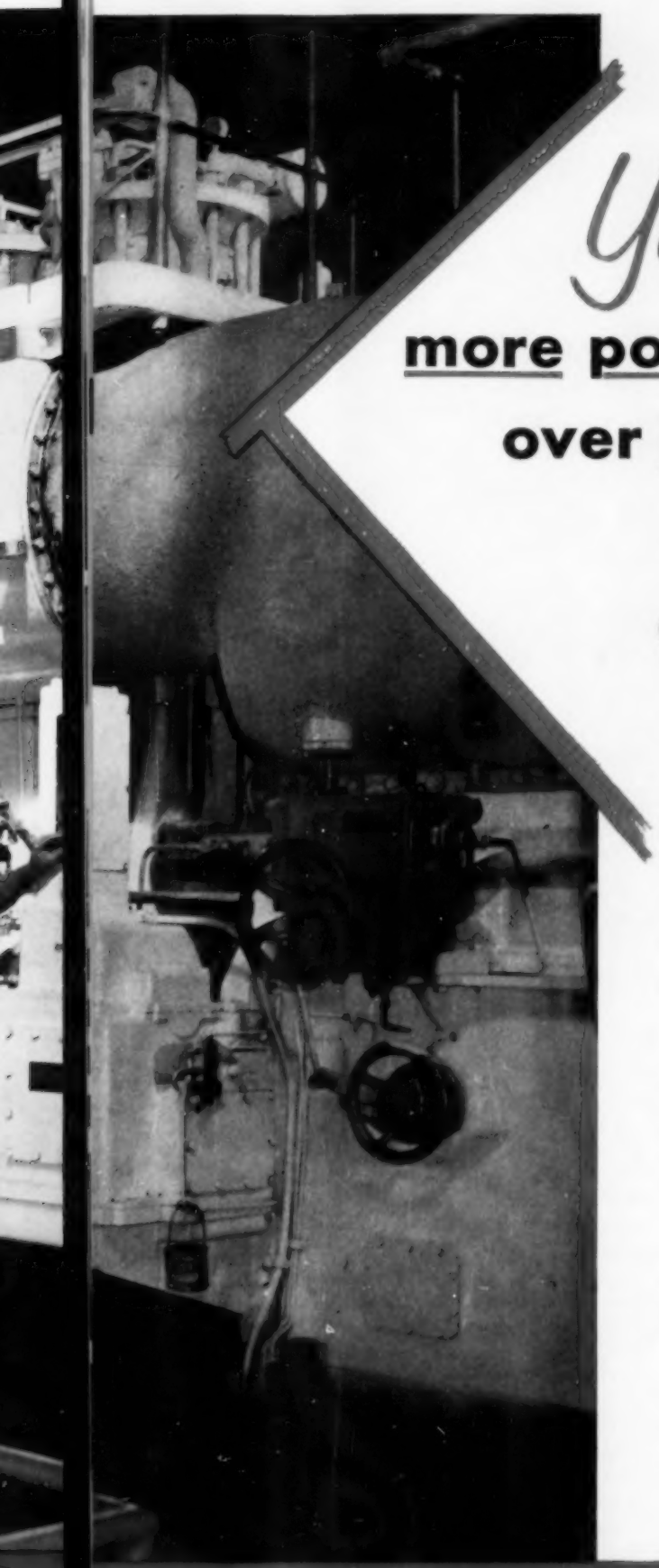
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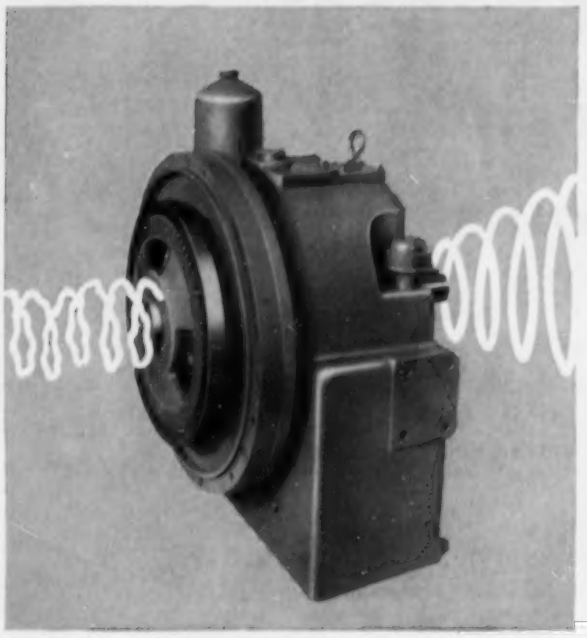
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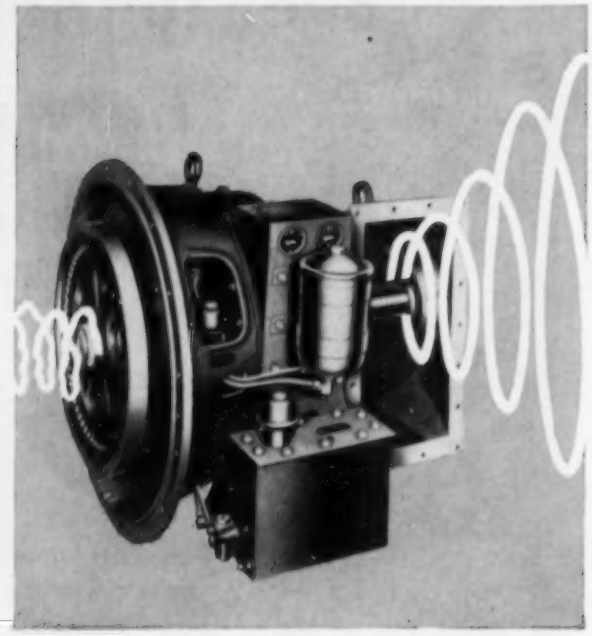
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URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

Single-Stage or Three-Stage Torque Converters?



Single-Stage Torque Converter



Three-Stage Torque Converter

The answer to this question depends largely upon the characteristics of the equipment you manufacture *or* use and the jobs it is required to do. Naturally, many factors must be known before any engineering department can be expected to make recommendations.

Generally speaking, however, when it is desired to have minimum pulldown from governed engine speed—with maximum power output over a wide range—and to produce high torque ratios for hoisting or heavily loaded vehicles, a three-stage torque converter, with torque multiplication up to *six times,* may be most desirable. On the other hand, where mild torque conversion is required, as in certain types of vehicles and in other industrial equipment — a single-stage converter may be the best choice.

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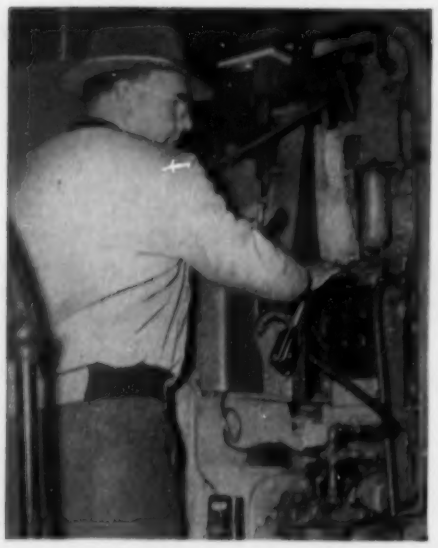
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FRONT COVER ILLUSTRATION

Large diesel excavator operating in the Naranja Rock Company's quarry near Miami, powered with a D8 and a D337 Caterpillar diesel with Twin Disc torque converters.

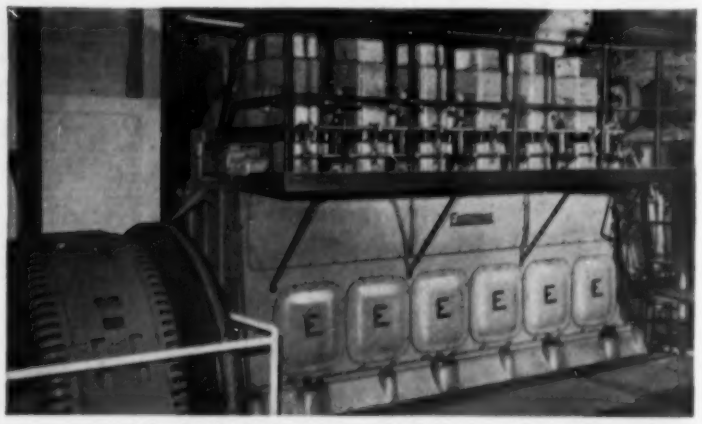


At the Dual Fuel "Select-O-Matic"® control, "Pete" Leslie demonstrates ease of change-over from dual fuel to straight diesel operation of 1000 kw Enterprise. Engine never drops a cycle changing either way!



"We Added an Enterprise Dual Fuel Engine—Now Save $700 a Month on Fuel and Lube Oil Alone!"

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Chief Engineer Perry "Jack" Jackson on routine inspection of Enterprise Turbocharged Model DGSQ-316. After two and one half years on local natural gas and diesel fuel oil No. 2, firing pressures and exhaust temperatures have remained exceptionally even.

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Mr. "Pete" Leslie points out what a really profitable power plant means to the city of Paulding. Electric rates have been reduced substantially. Street lighting, power for the City Hall, and a beautiful municipal swimming pool have been provided at no cost to taxpayers.

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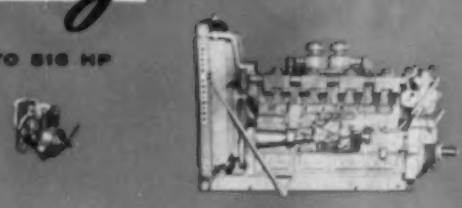
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any TYPE



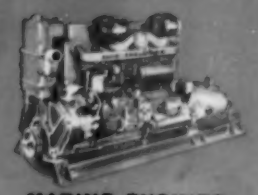
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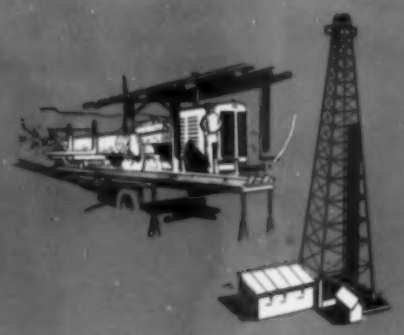
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BE-4

AiResearch Turbochargers





T-10





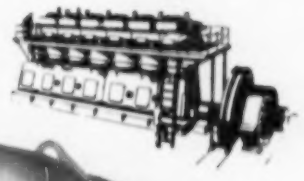
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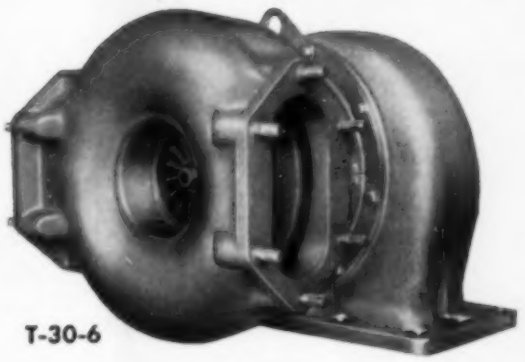
These scientifically-engineered turbochargers for your mobile, stationary or marine diesel engines are available now!



T-15







T-30-6





T-30-2

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They allow your diesels to operate at full efficiency from sea level to more than 8000 feet.

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MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

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AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.,
FIRM

Special oil maintains high average mileage record!



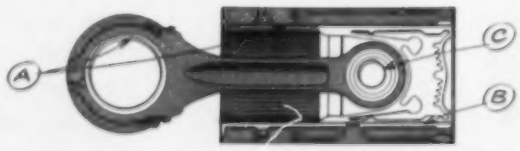
1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 354,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation

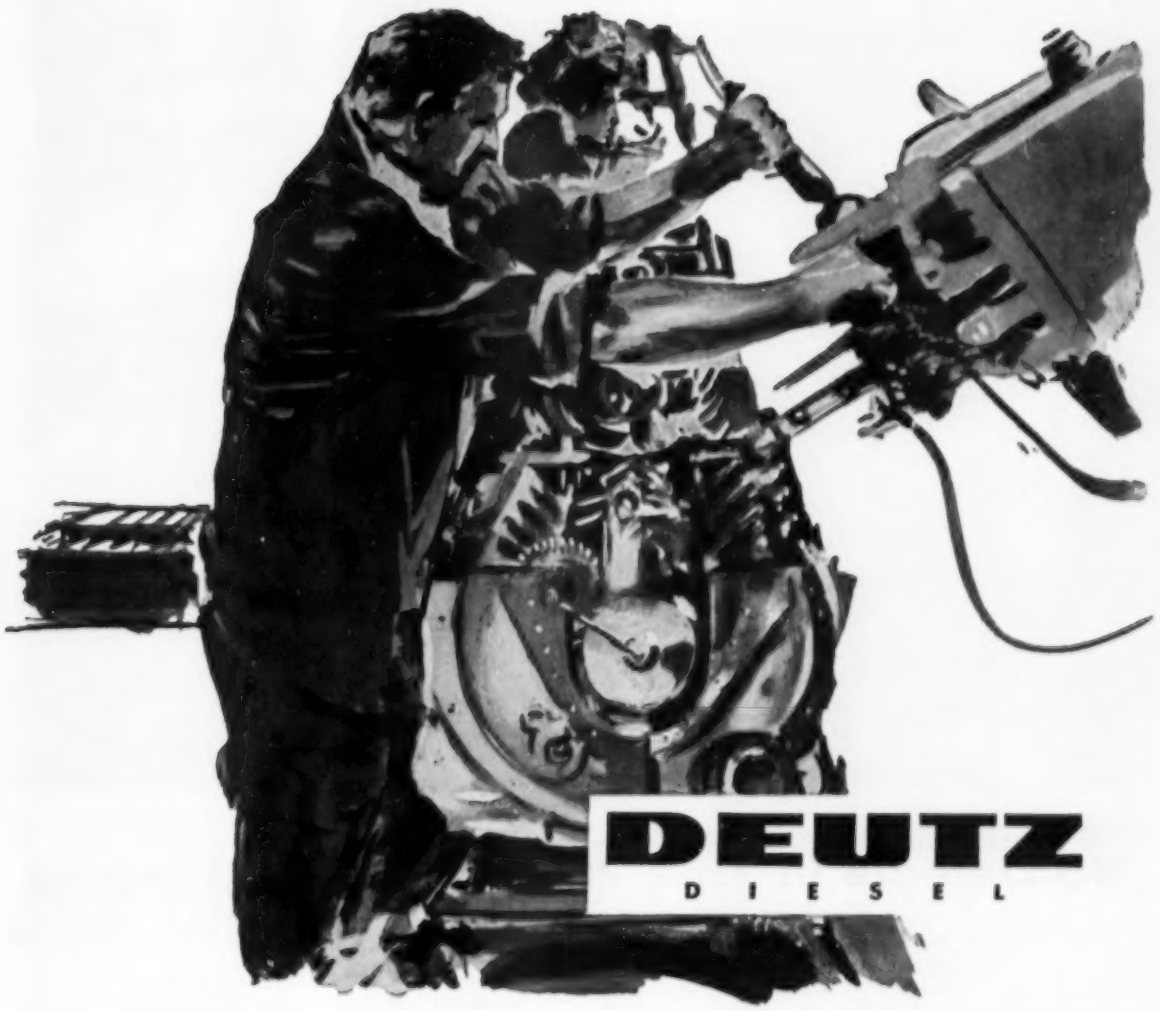


A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

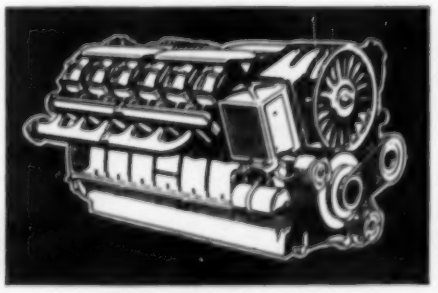
C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

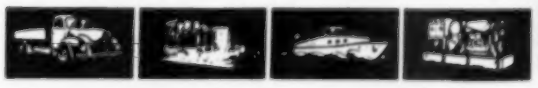
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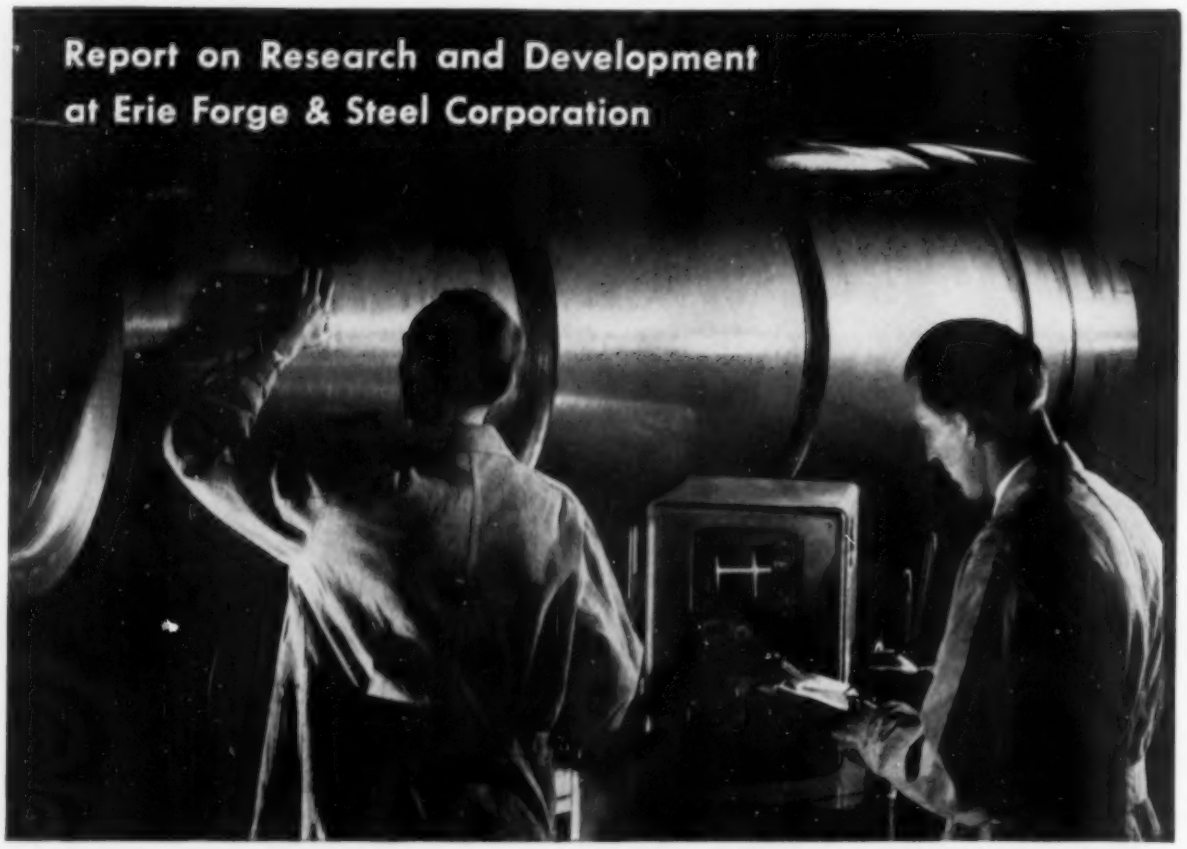
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- New compositions with greater ductility, notch toughness
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- New forging techniques to insure metal soundness
- Improved concepts in testing and evaluating quality

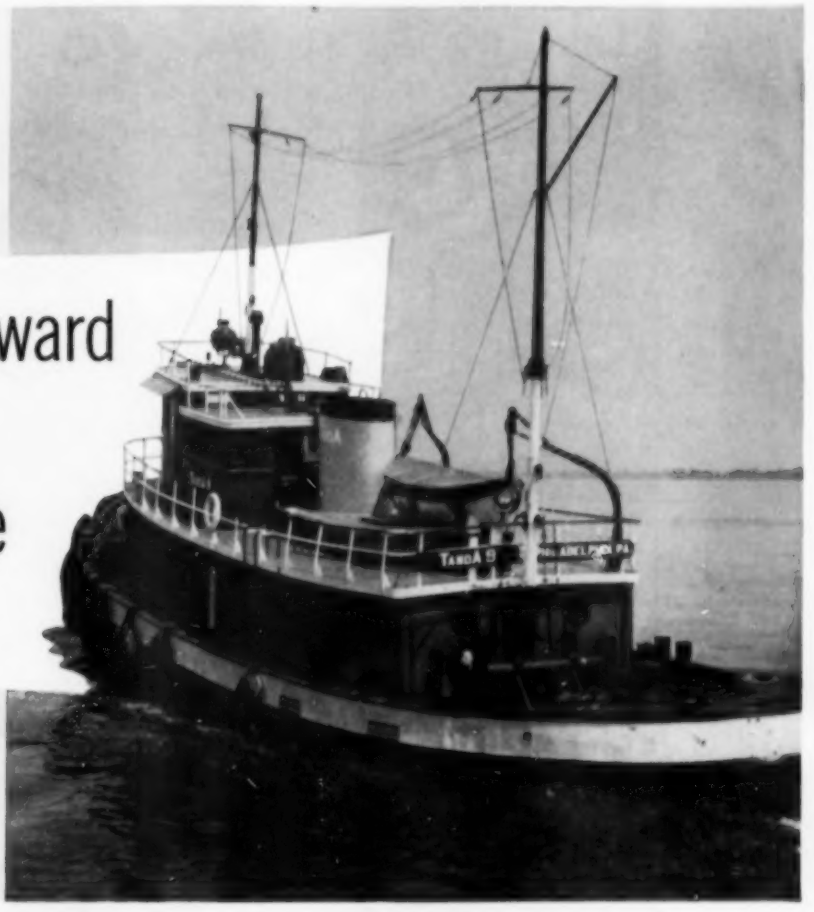
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a long
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life . . .

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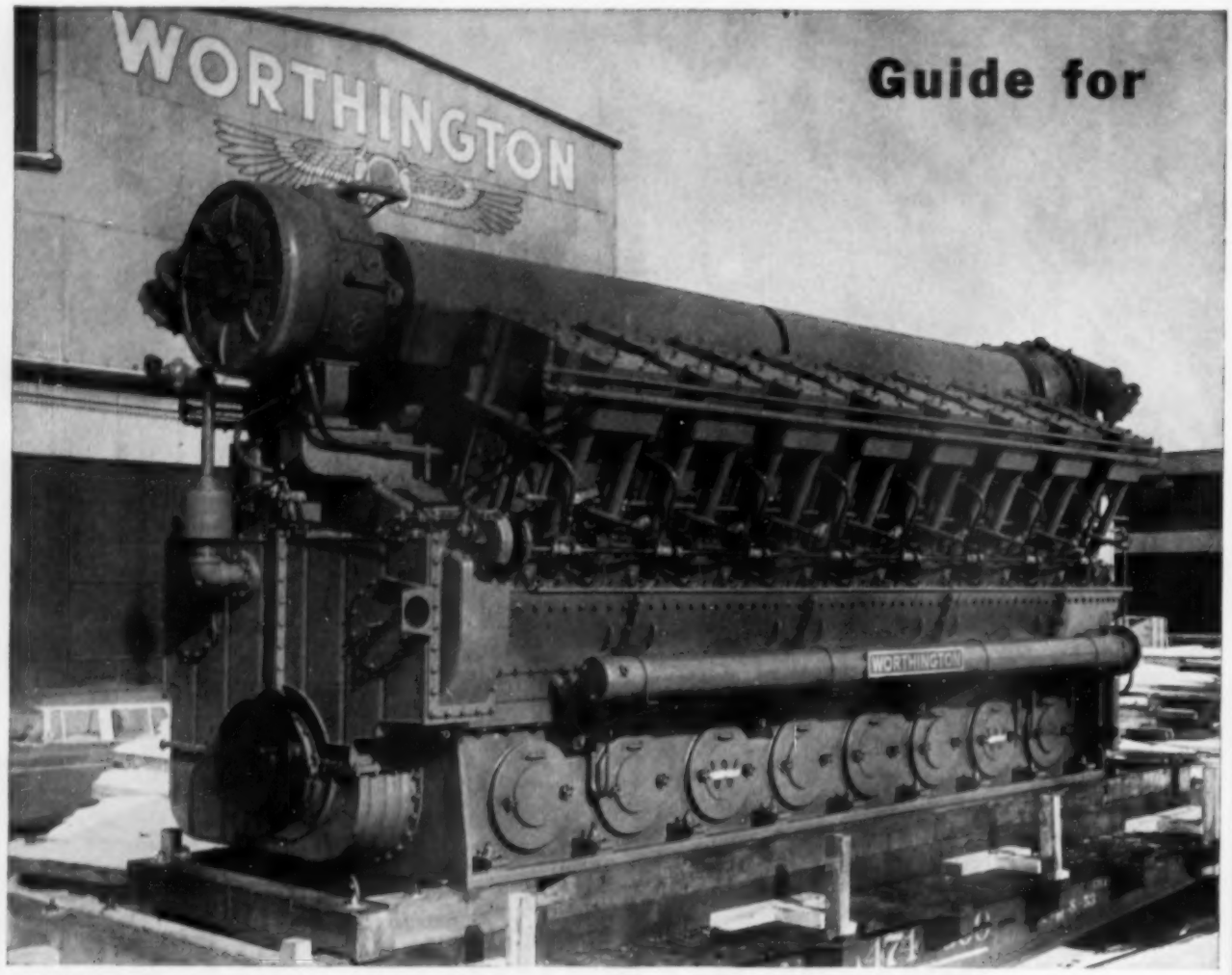
GULF DIESELECT—the straight run distillate fuel that burns evenly and completely, thus contributing further to engine cleanliness. And Gulf Dieselect has a high Cetane Index to assure good combustion at all speeds.

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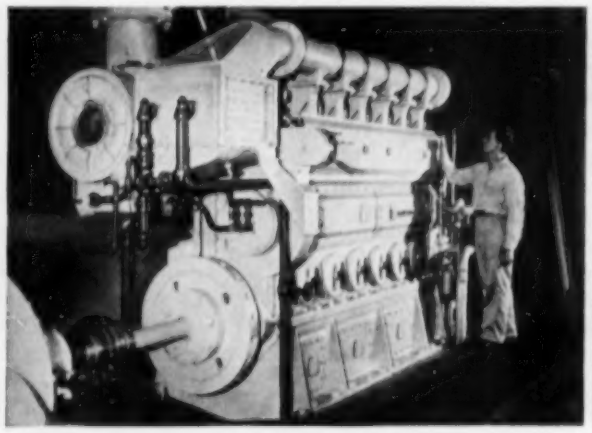
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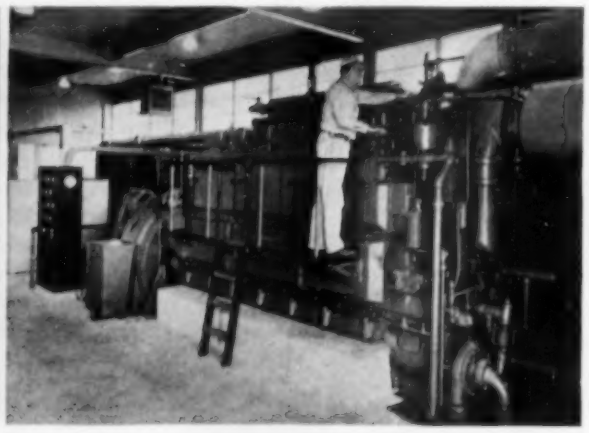


Guide for

SW 14. Designed specifically for turbocharging, Worthington's SW 14 engine features compact and massive construction for low installation expense, plus high performance on the most economical fuels available. This is America's first engine structurally designed and built for high pressure turbocharged operation. Available in ratings from 1,500 to 5,000 hp.



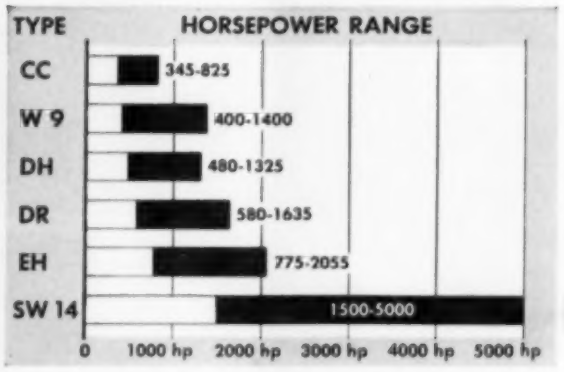
W 9. A medium speed engine of welded steel construction with a very low weight per horsepower ratio. Perfect for permanent power installations, it is easily adaptable for all portable applications such as rail cars, marine, drag lines, locomotives. Ratings from 400 to 1,400 hp.



DH. A modern medium speed engine suitable for permanent or semi-portable service. This unit has a long, successful field record with military, marine, industrial, and municipal applications. Ratings from 480 to 1,325 hp.

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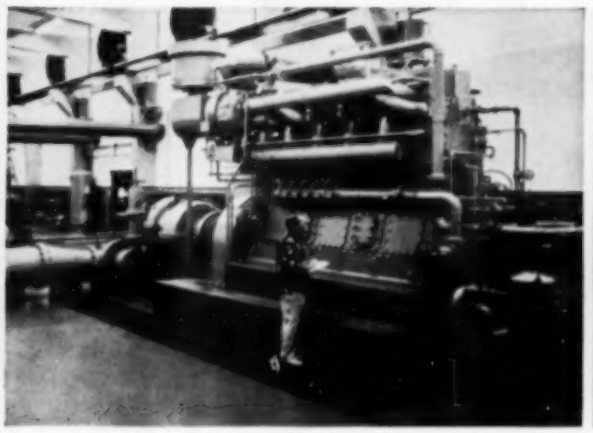
Hi-power performance with economy is yours with all Worthington diesels because each type has been engineered specially for its power range and service application. Such exclusive features as Dual Plunger Fuel Pumps, Automatic Thermal Air Control, Micro-metering Gas Valves and Self-aligning Exhaust Valve Seat Inserts make a Worthington diesel your best choice for long life and low maintenance.

Service is also a Worthington specialty. Experienced erectors will help supervise the installation of all Worthington engines. After your diesel is installed, complete service facilities stand behind it to assure you of continuous, economical power. If you should need replacement parts or repairs of any kind, you'll get fast action from the nationwide Worthington organization.

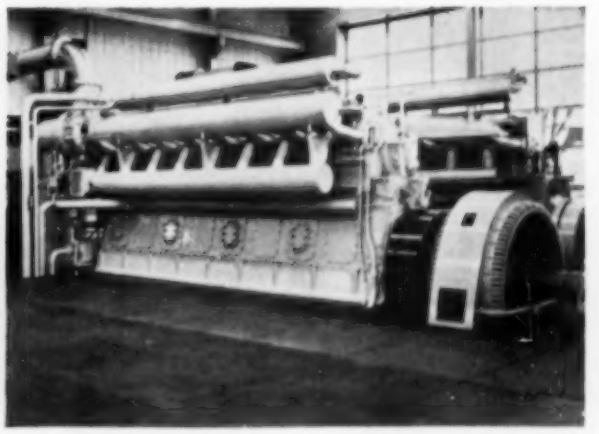
More than 3,000,000 hp of Worthington power engines are now serving industry in many different applications. If one of these engines is in your plant then you already know of Worthington's ability to combine outstanding performance with economy. If not, you'll want to get the full story from your nearest Worthington District Office. Or write to Section E62, Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

E-6-2

WORTHINGTON



DR. A low speed heavy-duty engine designed to operate on the lowest cost available fuels. Will give dependable service as an oil diesel, dual-fuel diesel, spark ignition engine, or on tri-power service. Ratings from 580 to 1,635 hp.

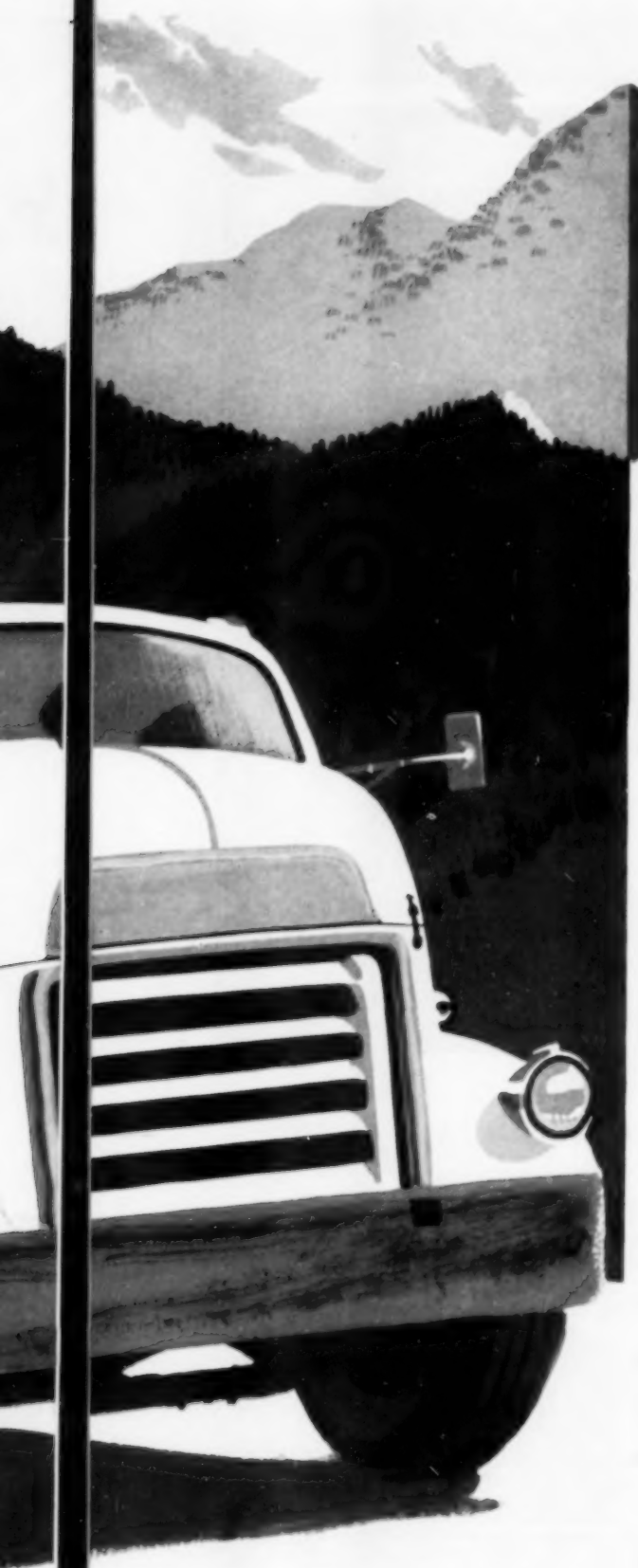


EH. A rugged engine for continuous, heavy-duty service. More than 500 type EH engines are in service in private, military, municipal, and utility power plants. In many of these installations, Worthington diesels are setting new records for continuous operation. Ratings from 775 to 2,055 hp.



GM
GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY



You can minimize downtime

in over-the-road service with Delco-Remy heavy-duty electrical equipment

Every unit in Delco-Remy's famous heavy-duty line is designed and built to take the day-in-day-out pounding of over-the-road operation . . . to give many thousands of miles of dependable service.

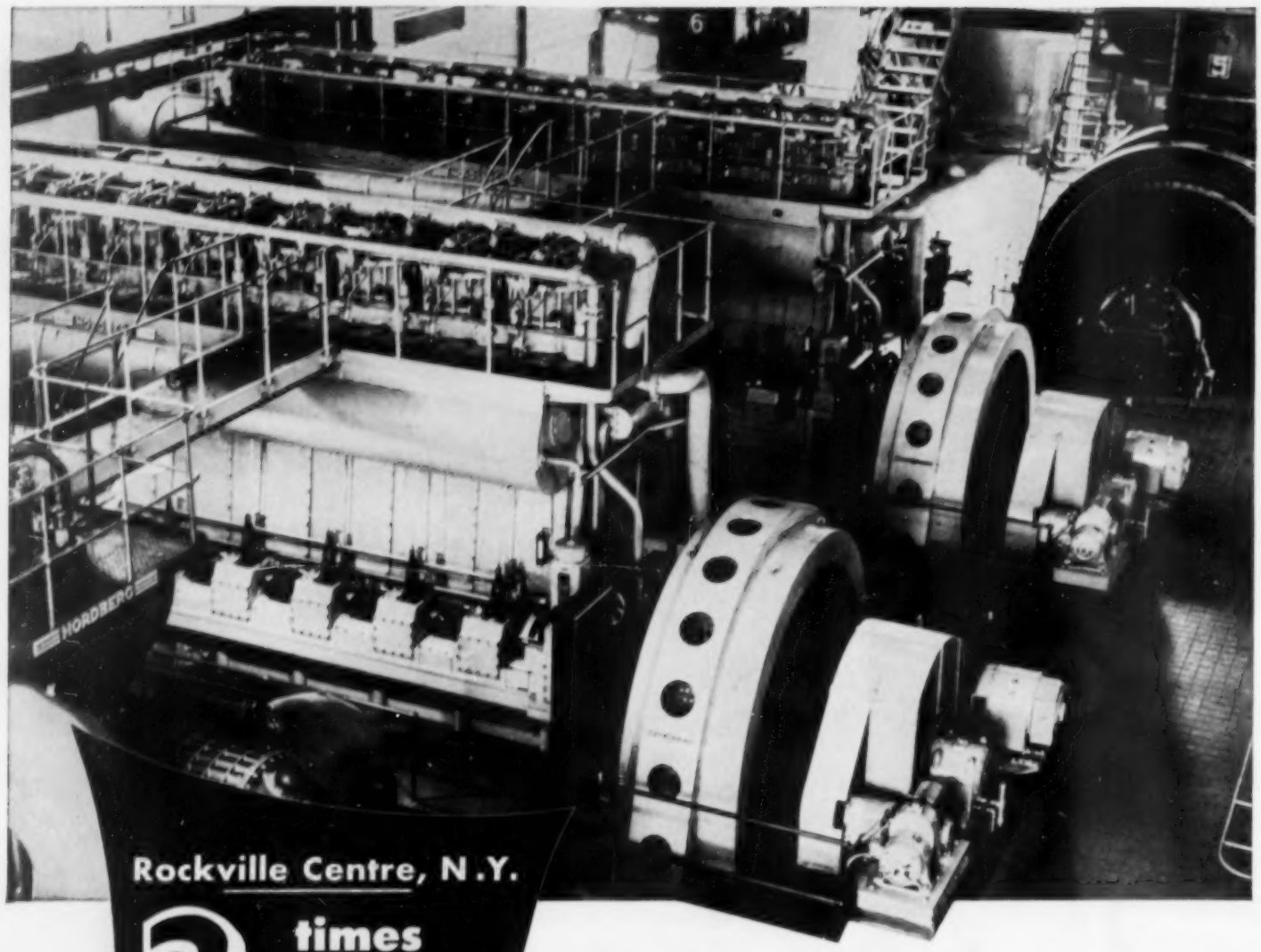
For example, Delco-Remy 5¼-inch diameter heavy-duty D.C. generators include such long-life features as extra-large commutator and brushes (brush life of 100,000 miles is common), ball bearings, wick-type lubrication with oilers, and forced ventilation. These generators are available, with matching regulators, in a wide variety of voltage ratings and output capacities.

Other specially designed Delco-Remy heavy-duty units include cranking motors, coils and other ignition components, and Delco long-life Extra-Duty batteries with rubber separators and Delcoloy grids.

For more dependable service with minimum downtime, specify Delco-Remy heavy-duty electrical equipment when you order new vehicles or modernize your present ones. Complete details on Delco-Remy heavy-duty electrical equipment are available through your nearest General Motors car or truck dealer, or the United Motors System.

DELCO REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

WAY STARTING WITH **Delco-Remy** ELECTRICAL SYSTEMS



Rockville Centre, N.Y.

3 times the power in the Same Space with NORDBERG DIESELS

Plant Reports Fuel Consumption of 14.77 KWH per gallon on NEW NORDBERG ENGINES

• Experience of the City of Rockville Centre, Long Island, N. Y., is evidence of the ability of Nordberg Diesels to meet increasing power requirements at low cost.

From their first small generator, installed in 1898, the present modern power plant has evolved . . . going from steam to diesel in 1927. By 1930, four diesels totaling 4600 hp occupied the entire original plant. These engines more than amortized themselves and are now gone. Today, four big Nordberg Diesels totaling 15,850 hp have replaced them in the Rockville Centre plant . . . *and occupy the same space as did the original four engines which produced only 4600 h.p*

Based on the excellent performance of the first two Nordberg engines, two more Nordberg units were installed in 1954. In referring to the performance of these units, Mr. C. P. Ketler, Chief Engineer, Public Utilities, Rockville Centre, writes . . . *"the kilowatt hours generated (in 1955) by the two 4500 hp Nordberg Diesels were 30,872,000, with a fuel consumption of 2,090,132 . . . or 14.77 KWH per gallon."*

Here is real proof of the installation and operating economy of Nordberg engines in modern power generation service. Write for further information, outlining your power requirements.

NORDBERG MFG. CO.
Milwaukee, Wisconsin

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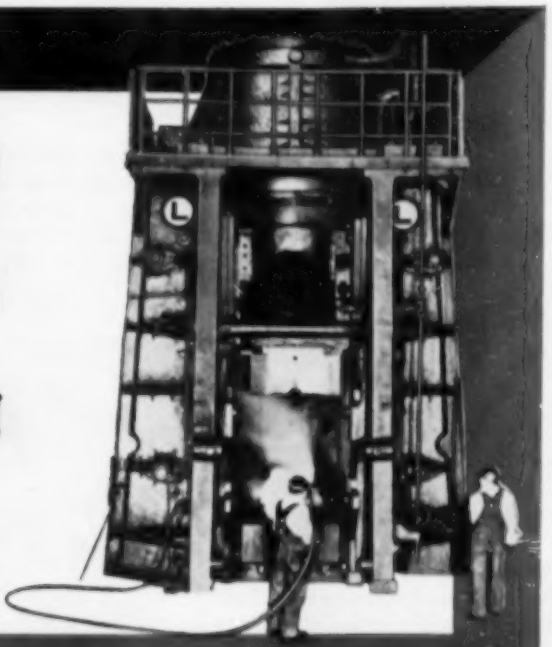
Builders of America's Largest Line of Heavy Duty Engines . . . 10 to over 12,000 hp.

NORDBERG
DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

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Pioneering in closed die forgings up to 10,000 lbs.





OFFERS NEW FREEDOM IN THE DESIGN OF LARGE DIESEL COMPONENTS

Ladish experience in producing tremendous closed-impression-die forgings offers engineers greater latitude in extending inherent advantages of the drop forging process to intricately shaped parts weighing as much as 10,000 pounds. Drop forging close to finish dimensions materially reduces metal and machining costs . . . while improvement in dynamic strength and toughness makes possible substantial reductions in dead weight . . . and higher factors of safety.

A discussion with a Ladish Forging Engineer will provide specific data on the ultimate economy and improvement in design you can impart to your Diesel components by specifying forgings . . . Ladish Controlled Quality forgings.

TO MARK PROGRESS

LADISH CO.

CUDAHY (Milwaukee Suburb) WISCONSIN

LADISH PACIFIC DIVISION, LADISH CO., Los Angeles, California

Controlled Quality DROP FORGINGS UP TO 10,000 POUNDS, WELDED AND SEAMLESS ROLLED RINGS UP TO 60,000 POUNDS

LADISH FORGING ENGINEERS AVAILABLE FOR CONSULTATION ON HOW FORGINGS CAN BE USED TO IMPROVE DIESEL PART DESIGNS

LADISH CO.
CUDAHY, WISCONSIN

We are interested . . . have a Ladish Engineer call to discuss application of forgings in our products.

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COMPANY _____

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CITY _____ ZONE _____ STATE _____

(DPE)

Inland River Reports

By A. D. Burroughs

WHILE the impact of the steel strike, along with the coal miner's holiday was noted almost immediately in boat action and activity along inland rivers, the launchings, new order placements, along with new lock dedication and the general river improvement programs continued with the pace of long-time river pioneer faith.

THOUGH river boat action is slowed by the steel situation, the *A. E. Dyke* was downbound on the Ohio with a gasoline and sand tow. Owned by the Coal City Towing Co., (Pittsburgh), built in 1951, this steady workhorse has a real performance record marked up during the past five years with its 400 hp developed from the Caterpillar D-397 engine.

STEEL CITY, the sternwheel towboat owned by Crain Bros., Inc. is an old-timer still in action on the Ohio. Built in 1929, originally known as the *Mary Alice*, Nelseco engines provide her rated 600 hp.

FOR the first time in the upper Ohio commercial trade we were able to watch the impressive performance of the *Aliquippa*. Owned by Jones & Laughlin Steel Corporation, built in 1952 by St. Louis Ship, this 116 x 27 x 9 ft vessel gets its 1400 hp for a neat economical operation from Superior engines.

RARELY seen in the Ohio waters was the *Suffolk* seen downbound making good time with power developed from her GM engines. Rated at 1800 hp, this craft was built in Houston, Texas by Bludworth shipyard and is reportedly owned by Cornelius Kroll & Company, Houston.

ONE of the famous Bayou fleet, *Bayou Teche*, owned by Oil Transport Co., New Orleans, was homebound with a sizable tow reporting good performance from the Caterpillar 8 cyl. engine, rated at 400 hp at 1200 rpm. The hull was built in 1943, with the present engine installed in 1951. This one was formerly known as the *Viva Clare*.

VALLEY Transporter, the Nordberg-powered MVBL towboat, made headlines in the big-tow category bringing in a tow measuring 1,754 x 175 ft, some 37 barges with 27,000 tons into Cairo, Ill., and cutting four days off the usual time route from New Orleans while towing the enormous load.

WITH the *Valley Transporter* establishing such fine performance records, the MVBL has placed an order with Dravo for a new 200-ft vessel to serve as a sister boat for the *Transporter* and the A. D. Haynes. The new craft is expected to be in service by late 1957.

MIDLAND Enterprises, Inc., Cincinnati, is the new owner for the three still-new, much-publicized inland towboats, the *Walter C. Beckjord*, *Tom Ragsdale*, and the *John J. Rowe*. All three modern vessels are powered by Baldwin-Lima-Hamilton engines, all constructed by St. Louis Ship, and all formerly owned by Ohio River Co.

THE Reagan Tool Company, Morgan City, La., is constructing the 240 hp twin-screw tug for the Freeport Sulphur Company, New Orleans. The tug will measure 43 ft-8 in. x 14 x 6 ft-6 in. No information on propulsion power was on hand.

RAYMOND E. Salvati, 2400 hp towboat powered by twin Enterprise engines has been launched and delivered to the owners, Island Creek Fuel and Transportation Company, Huntington, W. Va. Built by Dravo, the craft measures 148 x 11 x 8½ ft. and will be watched

ALLISON TAKES ANOTHER IN POWER TRANSMISSION

New "FourSpeed" Torqmatic Drive boosts vastly increasing hauling ability both



Built for the big jobs – that's the story behind the new Allison "FourSpeed" TORQMATIC DRIVE.

With its 350 horsepower rating, this TORQMATIC Converter-Transmission team has the brawn and heft to take the biggest loads and toughest hills, like a breeze.

The TORQMATIC Converter provides silken smoothness during starts and speed changes – the automatic lock-up drive provides big fuel savings during extended runs, and speeds hauling cycles on every road over any terrain.

This quick-shift TORQMATIC Transmission has the driving ease that makes the biggest off-highway trucks and scrapers handle like a driver's dream come true.

And with the built-in TORQMATIC Brake (optional), it's got a big extra margin of safety.

Many leading manufacturers of scrapers and off-highway trucks are planning to install this new "FourSpeed" TORQMATIC DRIVE to increase the performance standards of their equipment.

And the reason for the tremendous interest in this newest of all TORQMATIC DRIVES is simple.

It's the only heavy-duty converter-transmission team with an automatic lock-up drive, quick-shift range selection and TORQMATIC *Brake in one compact unit that is easy to install, free of troublesome piping and other miscellaneous accessories.*

For full details on the great new Allison "FourSpeed" TORQMATIC DRIVE in the equipment you buy or build, write Allison Division of General Motors, Box 894D, Indianapolis 6, Indiana.

closely by rivermen due to the many unusual engineering features involved.

TWO Cooper-Bessemer type JSDR-8-T four-cycle direct reversing marine diesel engines provide the rated 2400 hp for the new sleek *Carcrosse* now in service on the Mississippi River for her owners, Cargo Carriers, Inc. Measuring 150 x 33½ x 10½ ft, christening ceremonies were held in St. Louis with company president T. J. Hays; marine superintendent Capt. Don S. Wright; and assistant marine superintendent R. H. Hertsberg on hand.

LOTTA BULL, the 96½ x 26½ x 8½ ft triple-screw towboat delivered by Nashville Bridge to Bull Towing Company, Joliet, Ill., is reported to be a lot of boat, beauty, and power for the Illinois River service. Designed with retractable pilothouse, this 1440 hp craft is powered by a trio of 8-cyl. Model 31a8½ Fairbanks-Morse engines.

ANOTHER coal-burner bows to the diesel when the O. F. Shearer and Sons Co., Cinn., replace their *Sam Craig* with the twin-screw diesel boat, the *Lelia C. Shearer*, the 150 x 35 x 10½ ft towboat now under construction at Brownsville, Pa. Two GM engines will provide the planned 2800 hp.

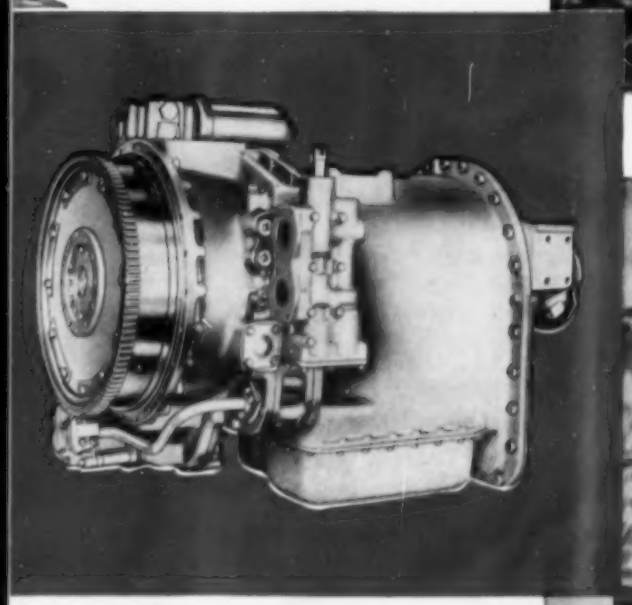
NOW at Missouri Dry Dock and Repair, Cape Girardeau, Mo., is the *Carol Dean*, 1600 hp towboat owned by J. Clyde Dean, Plaquemine., La. The boat sank in late June, raised in early July, and was built in 1948, rebuilt in 1952, equipped with GM engines. She was formerly known as the *Jane Smith*.

A RECENT photo received shows the busy *Mountaineer* in service on the upper Ohio. Owned by the Kanawha Sand Co., (W. Va.,) the 400 hp for this four-year-old craft is supplied by Cummins engines.

GIANT STEP PROGRESS

operating speeds, up-hill and down







GM TORQMATIC

Allison

TORQMATIC DRIVES



Factory Representative

Mr. A. F. Siers has just joined the Air-Maze Corporation as a factory representative according to the announcement by W. B. Watterson, Vice President of Sales. The Air-Maze Corporation, a Cleveland, Ohio firm, manufactures air filters and liquid filters for the engine, compressor and aircraft industries. Mr. Siers, who will handle special accounts in Ohio and Michigan, was formerly chief engineer of Twin Coach, Kent, Ohio, and chief engineer, General American Aerocoach, Chicago, Illinois.

Transmission Publication

The new summer issue of the magazine Transmission Topics has just been released by the Fuller Manufacturing Company, Transmission Division, Kalamazoo, Michigan. The cover, a modern toll highway view, sets the national transportation theme. Featured in this issue are Jack Cole of Birmingham, Spector of Chicago, Super Service of Nashville, Foster at Indianapolis—and Ivers and Transcon from California, to give a quick view around the country of transport modernization. Fuller Transmissions in off-highway trucks and earth-moving equipment are featured from such widely separated locations as British Columbia, Illinois, Oregon, Indiana, California and South Carolina.

The Fuller Service Division presents valuable information in an article on the right way to tow a truck or tractor. Also, in a story on heavy-duty truck transmission maintenance, the company offers its new booklet, Form 102, on transmission operation, lubrication, maintenance, parts inspection and trouble shooting. A copy of the new Transmission Topics magazine may be obtained now by writing to the Fuller Manufacturing Company, Transmission Division, Kalamazoo, Michigan.

They licked a problem—before it happened—with STANODIESEL Oil M

How Sturgis light plant planned ahead to eliminate source of possible power shut down

Sturgis, Michigan, light plant management in 1946 determined that it might be difficult to satisfy all power requirements if the light plant's large engine, or more than one of its small engines, was down. The plant is equipped with 5 engines—four GM 1,600 H.P. and one Busch-Sulzer 2,475 H.P. Plant management rightly figured that one of the keys to the problem was good lubrication. So, in 1946, STANODIESEL Oil M was tested in one General Motors engine.

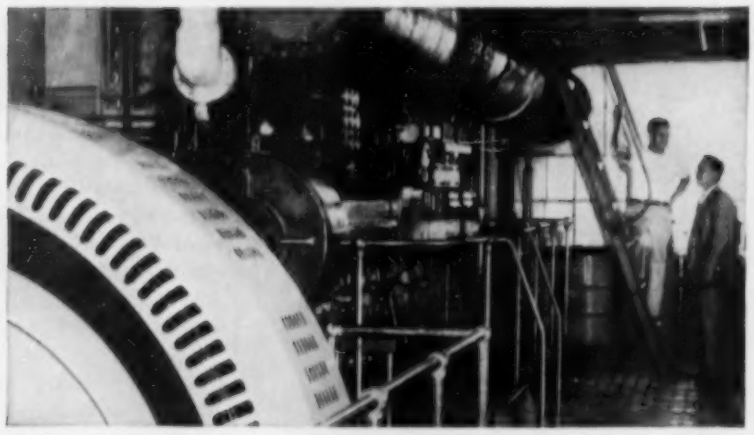
In 1947, based on its performance during the test, all engines were converted to STANODIESEL Oil M. In the nine years since, the plant has never had to shut down power to customers because of engine or oil failure. There have been no wear problems. Engines have stayed clean. There is no ring sticking. Bearing life is exceptional.

STANODIESEL Oil M can give this kind of performance for two big reasons: (1) its highest quality base stock, (2) its additive formula. STANODIESEL Oil M has superior stability. An oxidation inhibitor helps to prevent unwanted increases in oil viscosity. Detergent-dispersant additives keep crankcase, pistons, cylinder walls and other parts clean. An anti-foam agent controls foam.

There's a Standard Oil industrial lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Call him for more information about STANODIESEL Oil M. Or write Standard Oil Company, 910 S. Michigan Avenue, Chicago 80, Illinois.



J. J. Threlfall, superintendent and Donald Cripps, Standard Oil lubrication specialist check Don's data book on Sturgis light plant diesels. Don is well qualified as a lubrication specialist. He has been doing this work for nine years. He has an engineering degree from Michigan State University and is a graduate of the Standard Oil Sales Engineering School.



Sturgis, Michigan, light plant has four GM 1,600 H.P. engines and this Busch-Sulzer 2,475 H.P. engine. Engines receive progressive maintenance at 3,500 to 4,000 hours. STANODIESEL Oil M is used in all engines.

Quick facts about
STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by use of economy fuels.
- Maintains film on difficult to lubricate areas and parts.
- Eliminates spark plug fouling in spark ignited engines and reduces combustion chamber ash deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil commingle.

STANDARD OIL COMPANY
(Indiana)

STANDARD

TOWBOAT *MISSOURI* BURNS RESIDUAL FUEL

The Federal Barge Line Adds a Big New Ship to Its Fleet. The *Missouri* is Burning Residual Fuel Successfully with the Help of Vapor Phase High Temperature Cooling.

By L. H. HOUCK

AN outstanding development which promises to reduce the operating costs of large diesel engines in towboats as much as 50% by providing a practical method of burning residual oils at full throttle, has been installed on the four main propulsion engines of the new towboat *Missouri*, which started its shakedown cruise on Mississippi River July 15 after formal launching from the St. Louis Shipbuilding and Steel Company ways on June 27.

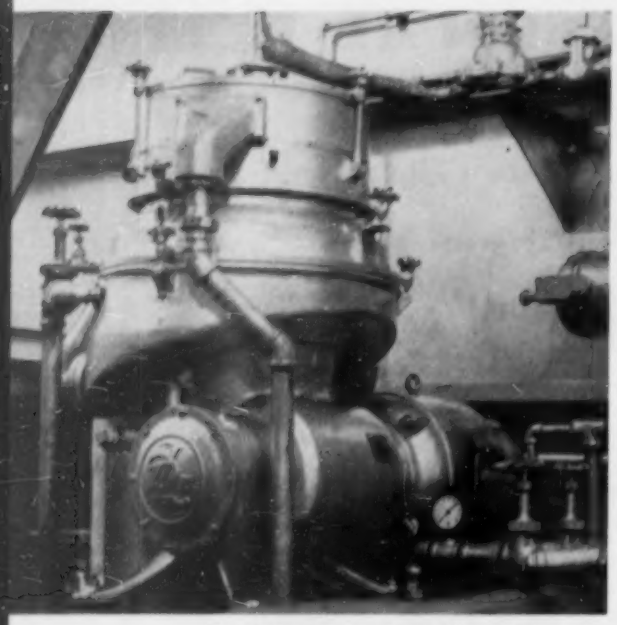
This installation marks the first time that the Nemec Dual Fuel system manufactured by Nemec Combustion Engineers, Whittier, California, has been combined with vapor phase cooling in a new towboat design, although the *Lachlan Macleay* also has recently been converted to full vapor phase cooling and dual fuel operation on its four propulsion engines. Incorporation of this cooling and fueling system in the *Missouri* is the result of extensive experiments carried out on the *Macleay*. These experiments proved so practical and economical in heavy duty river service, that the owners ordered the new system installed completely in the *Missouri* from the start of the first line on the drawing board. Both boats are owned by Federal Barge Lines, Inc., St. Louis.

Diesel engine operators have been burning heavy residual fuels for some years now with varying degrees of success, but often only after mixing with No. 2 diesel fuel or some of the other lighter and cleaner fuels, and the use of heavy fuel has been accompanied usually with a number of troublesome problems which have been greatly lessened with this new system. Some of the obstacles overcome has been low flash point, pumping difficulties due to low viscosity, high corrosion factors and heavy etching due to multiple contaminants which include sulphur and derivatives such as sulphuric acid, to say nothing of hard carbon cones and other types of clogging materials formed on injectors.

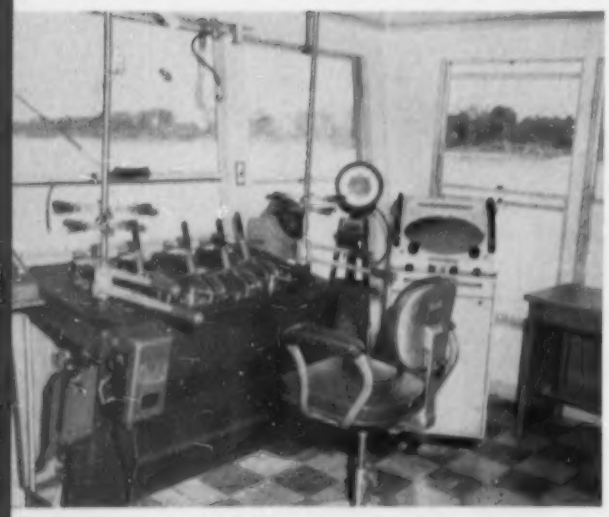
The Nemec Dual Fuel system automatically switches the fuel supply from No. 2 diesel fuel to residual fuel when the propulsion engines are at full throttle, and then back to No.2 fuel when the engines are idled down again. This system per-

The *Missouri*, newest towboat in the Federal Barge Lines fleet, is equipped with vapor phase cooling and the Nemec Dual Fuel system to burn Bunker C fuel in its four GM Cleveland main propulsion diesels.



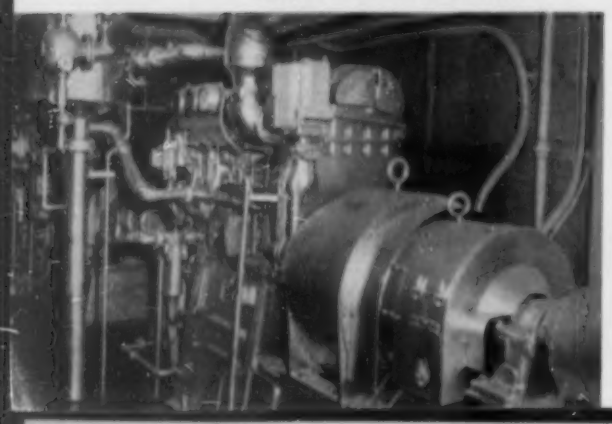


Heavy duty DeLaval centrifuge used to clean the residual fuel before it is burned in the engines. This machine is capable of handling about 600 gph of average No. 6 residual fuel, and continuously separating and discharging the undesirable sludge from the oil.



Pilot house console. Pilot uses levers direct-connected to engines for control and can lock the four engines in pairs for maneuvering.

The two 100 kw generator sets powered with Model 3-268A Cleveland diesels and cooled with vapor phase. Marquette governor and Purolator lube oil strainer can be seen.



mits the satisfactory handling of residual fuels in the viscosity range of 300-650 ssu at 100° F. in medium and large size diesel engines. The dual fuel system is composed of essentially eight component parts: fuel injector gear pump and motor, injector heater, primary filter, final filter, dual fuel selector valve, circulating heater, circulating gear pump and motor, and suction strainers. The injector and circulating gear pumps in this installation are designed for approximately 240 gph at 1750 rpm. The electric motors are both ⅓ hp, 64-75 volt, dc, specially designed and heat resistant. Electric motors can be supplied for other voltages upon demand.

The injector system heat exchanger of the Nemec System is designed to raise the fuel oil temperature from ambient temperatures to 160° F., or engine coolant temperatures, at approximately 50 gpm coolant water flow. Steam can also be used as a heating medium up to a maximum of 35 psi, and is used in this installation, being provided by the vapor phase cooling system. The primary filter is a 28 in. regular lubricating oil filter element. The final filter is a dual paper, resin-impregnated filter with two elements connected in parallel and used in sequence. The dual fuel valve is connected electrically to the engine throttle circuit, actuating a solenoid pilot valve, which operates fuel valve.

This compact Nemec unit, which measures only 56 in. high, 45 in. long, and 27 in. width, circulates, heats and filters the residual fuel in the dual fuel system as well as controlling the switching from light to heavy fuel automatically. The circulating pump for the heavy fuel draws oil at approximately 200 gph from the main residual fuel tank and discharges through the built-in heat exchanger back into the tank to maintain main body of oil at a temperature for good flow qualities.

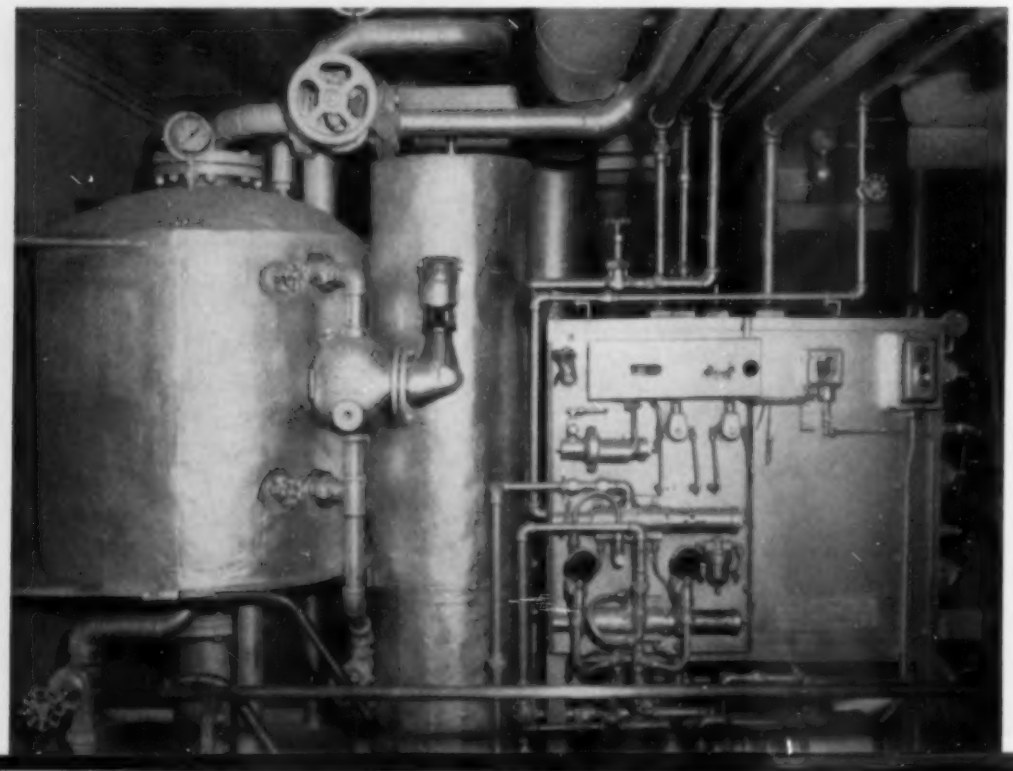
The dual fuel system fits hand in glove with vapor phase cooling in this installation because



the steam generated from the vapor phase operation is used to heat the residual fuel in the fuel heating part of the dual fuel system, as well as keeping engine temperature at a high level to facilitate the flow of the heavy residual fuel in the engine. Steam generated by vapor phase is used to preheat the residual oil before it is centrifuged.

The development of this system of burning residual fuels, according to St. Louis Ship officials, not only reduces fuel operating cost from 25 to 50%, but reduces maintenance costs to a very economical level at the same time. Such significant economies make this new fuel system of prime importance and it has possibilities of contributing greatly to reducing operating costs for towboat operators, as well as other users of heavy diesel engines.

Vapor phase unit and Nemec Dual Fuel system for each engine, as installed in the upper engine room. The dual fuel unit automatically switches the fuel supply to the engines from bunker C at full power to No. 2 diesel fuel when the engines are idled down from full power. The Bunker C fuel is also kept heated, filtered and in a constant state of circulation by the system prior to injection in the engine.





The four main propulsion engines are each equipped with vapor phase cooling and a dual fuel system. These engines are Cleveland Diesel Division of GM Model 12-567 diesels, rated at 900 hp at 750 rpm, driving 4-bladed 78 in. alloy steel propellers at 250 rpm through Falk 3-11 reverse and reduction gears. The *Missouri* also has two auxiliary diesels equipped with vapor phase cooling, but not the dual fuel system. These engines are Cleveland Diesel Model 3-268A, each driving a 100 kw 440 volt ac generator, and they burn regular No. 2 diesel fuel at all times.

Extensive tests with the *Lachlan Macleay* showed that the new system keeps injectors clean, and the maintenance of a high heat level alleviates the problem of corrosive materials forming and causing high wear rates in the engines. The *Macleay* was originally delivered with two cooling systems. One system used the conventional skin cooling ducts and circulated jacket water, and the vapor phase cooling system was used on two of the main engines. After several months of operation, Federal Barge Lines requested conversion of all engines to vapor phase cooling, but in order to obtain comparative data, the changeover was delayed six months. When the changeover was made, one of the main engines was fitted with dual fuel equipment also, burning bunker C at full throttle. The great savings in fuel and the excellent performance in conjunction with vapor phase cooling that was observed led to ordering the equipment on all four propulsion engines of the *Missouri*.

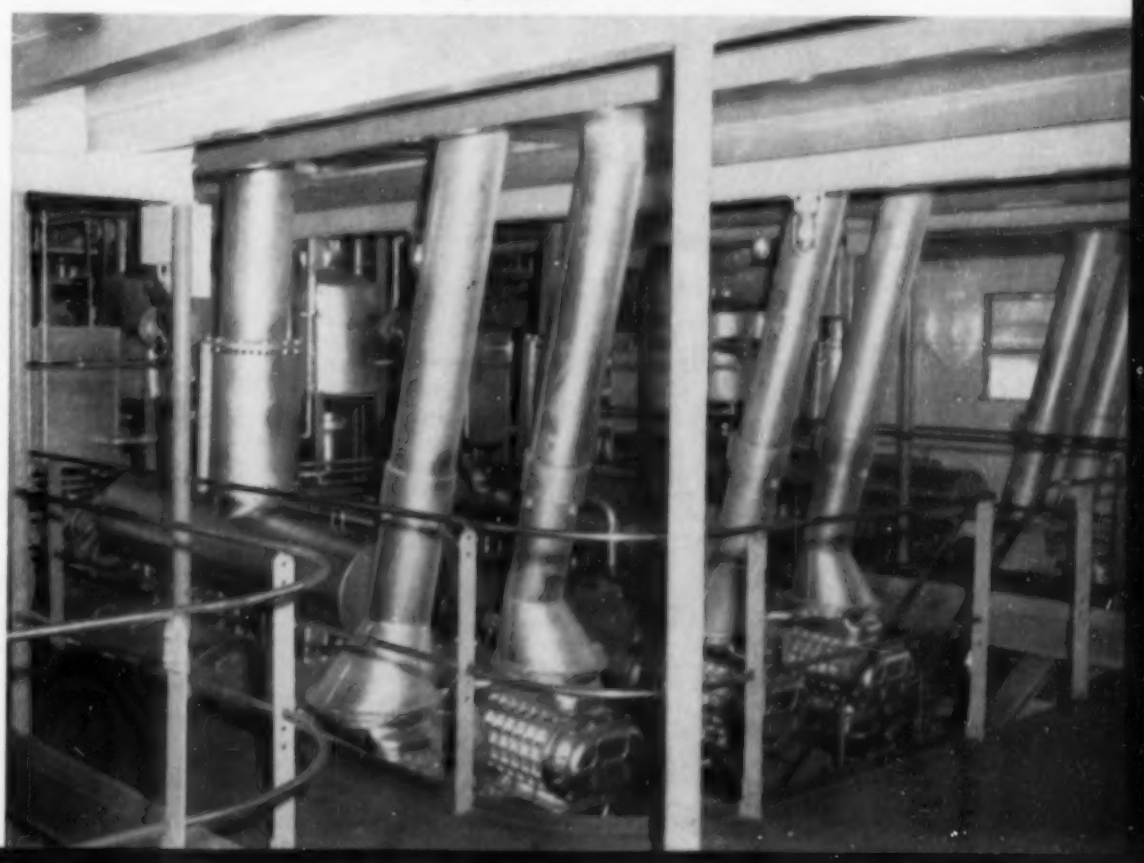
The *Missouri* is a boat of outstanding appearance. Its profile marks a modern trend in boat architecture. It was made from a design submitted by Designers for Industry, Inc., and adapted by St. Louis Shipbuilding & Steel Co. The steel hull is 162 ft long, 45 ft wide and 10 ft deep with an operating draft of 5½ ft. It is equipped with four Kort nozzles which will give 25% more pushing power than the *Lachlan Macleay*, which makes another added economy for the new boat. Light draft, so essential in river operations, required as well an extra strong hull. The *Missouri* has vertical and horizontal stiffeners, thick bulkheads and 30 watertight compartments.

Control of the main engines and reverse gears is direct from the pilot house console, where the pilot can lock controls of two of the four engines, so that he can use the engines in pairs for maneuvering. Westinghouse Airbrake pneumatic controls are used. The *Missouri's* steering system is a St. Louis Ship development, a hydraulic mechanical type by which one system controls four steering rudders and the other controls six flanking rudders with a hard-over to hard-over in 13 seconds under full load.

Ross lube oil coolers, Hilco lube oil filters and Purolator lube oil strainers are installed. Five fire hose outlets are supplied by a 100 gpm 5 hp Aurora fire pump and a 120 gpm 5 hp Carver bilge pump has suction connections in all compartments. Transfer of fuel oil between tanks and from bunker tanks to day tanks is accomplished with two ¾ hp Gould pumps and two ½ hp fuel service pumps made by Viking. Exhaust silencers are by Burgess-Manning and the fuel oil centrifuge, an essential element of the dual-fuel system, is a heavy duty unit made by DeLaval. Dry type air filters for the engines are also by Burgess Manning. Vapor phase high temperature cooling system is by Engineering Controls, Inc., St. Louis, Mo. Heating boiler, Dual-Vectors (a finned coil and circulating fan in each stateroom), water chiller and cooling tower and wash water heater are by Crane. The water system makes use of river water with a wash water still by Davis, a filter by Hygeia, a chlorinator by Wilson and a portable water heater by Seper. Cutler-Hammer controls and Century motors are used on auxiliaries. The advanced engineering in the pilot house includes RCA radar, Sperry Gyro repeater, Bendix Fathometer, Executone intercom system, 8-in. Triplex Kahlenberg air horn, two 19-in. 45-amp Carlisle-Finch arc search lights. Compressed air for engine starting, Airflex clutches and air whistle is furnished by two 23.5 cfm Quincy air compressors driven by 5 hp Century motors.

In a radical departure from typical towboat profile the deckhouse is of all welded steel construction with a steel partition at the forward end of the engine room. All surfaces exposed to the weather are insulated with 2-in. thick Ultralite insulation and lining and partitions are of ¼-in. tempered Masonite. The *Missouri* represents throughout, some of the most advanced engineering on river towboats in more than a decade.

Three of the four GM Cleveland main propulsion diesels, each generating 900 hp at 750 rpm, as seen from upper engine room. They are all equipped with Marquette governors.

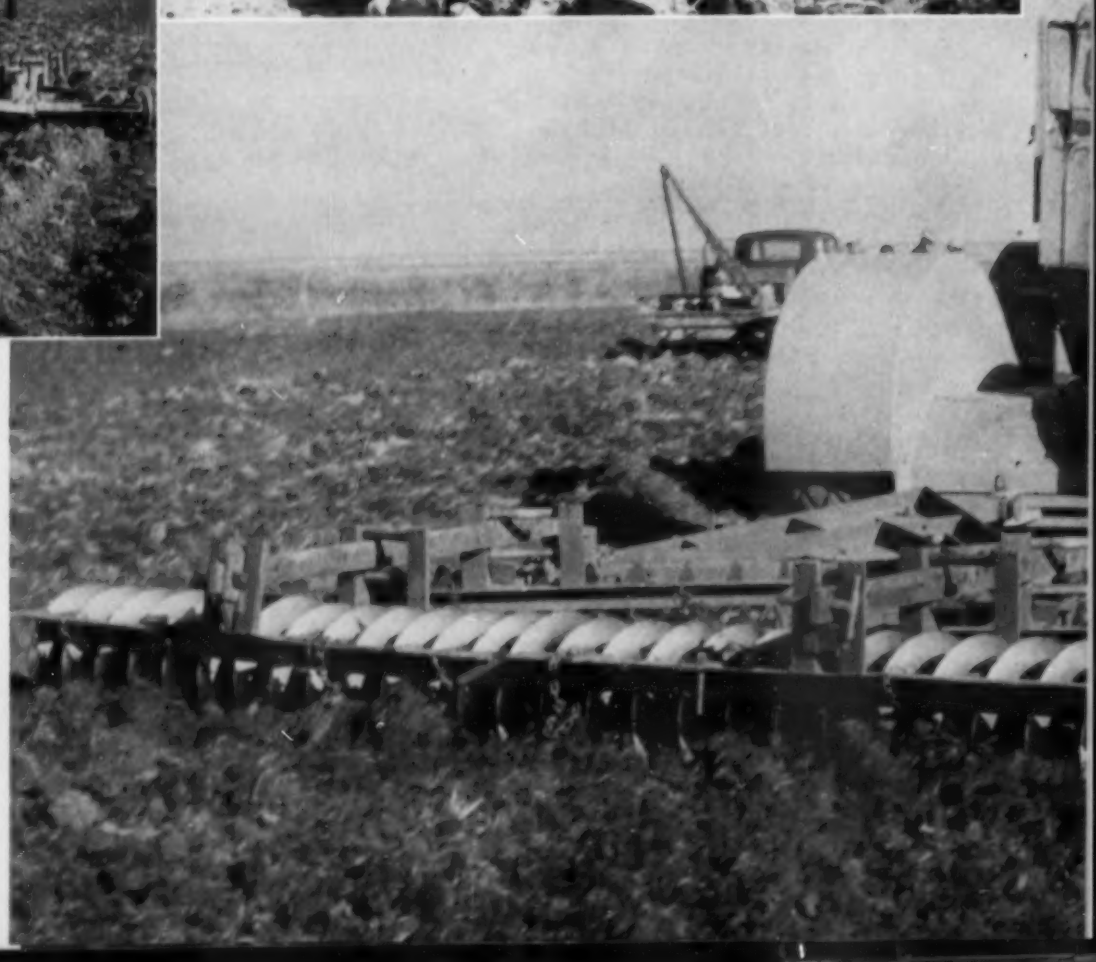






At top—Here a Kern County rancher is using a Wagner 4-wheel drive tractor on his own Be-Ge scraper in developing a raw piece of land for cotton, potatoes, corn, alfalfa or vegetable crop.

Above—Wagner TR-9 (with cab) 4-wheel drive tractor pulling 16 ft tandem disc at Blue Moon ranch 18 miles west of Shafter, California.



Wagner tractor powered by a Cummins diesel doing a beautiful job of working up a seed bed in a heavy disking operation.

WAGNER 4-WHEEL DRIVE TRACTOR

By F. HAL HIGGINS

THIS Wagner 4-wheel drive tractor is our answer for big farm tractor power," declared partners Firestone and Elrod when this reporter stopped off at Bakersfield to check on the latest in dieselized farm, oil field and dirt moving equipment. This was the second time the Wagner tractor had been mentioned to the writer as something he shouldn't miss in farm diesel machines making history. In Arizona, two years ago, a heavy equipment dealer, who handled Buda-powered strip mining machines, had just sent a Wagner 4-wheel drive tractor into the Yuma area and reported it was making a name for itself in a new territory and was sure to go places.

The writer missed it in that area because it had been moved. So, having known that the seven Wagner brothers up at Portland had been producing rugged loaders and portable scaffolds for buildings in the construction fields, this writer decided it was an opportunity to learn by seeing what the new models of Wagner tractors were doing in Kern County where they talk of ranches in sections rather than acres of cotton, grain and potatoes. Here oil field development, over the years, is the big industry ahead of agriculture, and every kind of equipment must be rugged and prove itself with men who know what they want to do with tools and machines in their field.

"We just took on the Wagner line of tractors in time to present them at our Kern County Fair," explained Hal Elrod, partner with Firestone in Growers Supply Company, dealer in the Massey-Harris line. "Since then, we have been getting calls from all the big progressive cotton, potato, grain and vegetable farmers for demonstrations. We let them take out a Wagner and use it on their own plows, disks, land levelers, etc., to work their own lands. They are finding the Wagner very fast, and some find it can do the work of two of their older tractors. Then the moving over highways from farm to farm is easily done with the Wagner tractor under its own power. Also, we are finding some thinking that the faster plowing breaks up the dry, hard soil better. We have sold one, and the other is about sold with its trial now in progress. More Wagners are coming."

"Look at what we have for the farmer, contractor and oil field operator; three sizes with the Cummins diesel driving each; Fuller Roadranger transmission with 10 speeds forward and individual axle oscillation to reduce vibration and wear and tear on the tractor over rough going; 4-wheel steering as well as 4-wheel drive. We are finding that it will handle land planes, disk harrows and scrapers at exceptionally high speeds. The Wagner has a road speed of 25 mph and when you note how all big California farmers have land scattered over miles, you get some idea of the value of this ability to move from field to field over highways without any halt. It adds up to a big saving."

Wagner Tractor Specifications

	TR-6	TR-9	TR-14
Diesel engine displacement	302 cu. in.	495 cu. in.	672 cu. in.
Drawbar hp	57	78	96
Road speed	25 mph	25 mph	25 mph
Transmission	8 spds. fwd.	10 spds. fwd.	10 spds. fwd.
Total weight	9,800 lbs.	13,500 lbs.	15,800 lbs.
Wheelbase	7 ft. 9 in.	8 ft. 5 in.	8 ft. 10 in.
Brakes	hydraulic	hydraulic	air

All models have planetary drive axles. A straight drive axle is optional.

On the TR-6, about 2,400 lbs. additional counterweight is gained by hydroflating the tires; on the TR-9, 4,080 lbs. additional and 6,000 lbs. more on the TR-14.





The first Wagner 4-wheel drive tractor in the hands of a Kern County rancher pulling a heavy 4-bottom Atlas Reversible plow. Its work in turning dry soils at deep penetration adds to seedbed depth for more root and water penetration and bigger crops, say soil experts. Also fast operating speeds of the tractor tend to break up the heavy dry soils very well. The three sizes of Wagner tractors are using Cummins diesels of 57, 78, and 96 hp.

OHIO BELL DEPENDS ON DIESEL

New Diesel Meets Increased Standby Need Of Ohio Bell At Canton. 525 Horsepower Fairbanks-Morse Engine Provides Full Protection For Both Telephone Equipment And Building Services.

By DWIGHT P. ROBISON

INCREASING load on Ohio Bell Telephone Company's Canton-Glendale exchange has necessitated the installation of more powerful standby facilities at Canton to guard against failure at the normal commercial electric power source. A 525-hp Fairbanks-Morse opposed-piston diesel driving an F-M alternator was selected to provide the energy to operate all telephone equipment and to supply all other essential power and lighting needs of the building as well. Three factors have contributed to the increasing power requirements of the Canton exchange. First, rapid growth in the Canton area since the end of the war has resulted in a heavy demand for new telephones bringing the total in service to 61,722 in 1955. Second, the importance of this office as an East-West switching center has resulted in a service load far beyond the norm for a city of this size. In fact, there are more calls placed through the Canton office than through the larger metropolitan center of Youngstown, only about forty miles distant. Finally, the increasing automation of telephone services has steadily demanded more electric power.

By 1954, the power loads had increased to the extent that existing standby facilities were not adequate for company needs. At that time, standby protection consisted of two 60 kw diesel-generator sets, and a storage battery installation capable of supplying a 3 busy hour reserve to the telephone equipment. The battery installation was able to carry the existing telephone load and the emergency 48 volt lighting system, but was not large enough to supply any of the other building needs. The diesel-generator sets were not even able to supply sufficient energy to operate the telephone equipment. Thus, after a maximum of 3 busy hours, the office would have to curtail activities. Early in 1954, officials of the Ohio Bell Telephone Company determined that expansion and modernization of standby facilities was imperative.

In selecting new standby equipment, several important factors were taken into consideration. To increase the size of the battery installation would involve considerable expense and would also necessitate strengthening of the floor to accommodate the additional battery weight. Also, sufficient floor space was not available. A diesel-generator unit could be installed for substantially less, and because of the lightness and the quiet operation of the Fairbanks-Morse opposed-piston diesel, the compact unit could be factory-mounted on a steel subbase to rest on the basement floor, without requiring additional bracing or foundations. A standby battery installation would serve no longer than 15 years, while the heavy-duty standby diesel unit should last twice that long. Also, the battery installation could only be used for limited periods of time, and the diesel would be able to provide continuous standby protection regardless of the length of commercial power interruption. Installation of a diesel of adequate size would provide three power sources for operation of telephone equipment. First, of course, was the normal commercial power supply. The diesel would provide full protection for unlimited service of both phone and essential building equipment. The existing standby battery installation carried the telephone load and the emergency 48 volt lighting for a limited period.

The engine selected for this important operation was a Fairbanks-Morse Model 38F5¼ opposed-piston diesel—one of the new small OP's. This 525-hp unit, with 5¼-in. bore and 7¼-in. stroke develops rated hp in its seven cylinders at 1200 rpm. The engine drives directly an F-M Type TGZJ 350-kw alternator with direct-connected exciter. The unit generates enough power to carry all present essential lighting and building power plus the present telephone load and still provides adequate reserve for anticipated increases. In effect, the diesel takes over the full job of the utility high line for as long as the normal supply is out. The Telephone Company's engineers prefer to start the diesel manually to permit a check of the electrical and mechanical equipment, partly because of the expense involved in automatic starting and partly to insure by manual check that the engine is properly lubricated and is otherwise in such condition that it can safely carry the load.

The standby diesel-generator unit is tested under load once each week to be certain that it is always ready to operate in the event of commercial power failure. Easily capable of generating present power requirements for the telephone equipment and essential lighting and building power require-



Mr. J. A. Stanley, Foreman of Buildings for the Canton District, inspecting the new Fairbanks-Morse diesel-generator standby unit in the Canton, Ohio Bell Telephone Company building. Alnor Pyrometer can also be seen.

A CIVIL DEFENSE INSTALLATION

ments, the standby unit provides some margin of reserve power for contemplated load increases. This reserve will soon be committed for total load will reach 450 kw after a 1956 addition is completed. Ohio Bell officials at Canton are continually increasing the extent of automatic equipment in this plant, and expect to have a completely automatic toll ticketing system in operation by 1958. Failure of ac supply to this equipment even for a short time would result in loss of entire toll billing during power failure. But the most important consideration to Ohio Bell Telephone Company is that three separate power sources will insure uninterrupted service to the community.

Editor's note: Whilst more and more diesel engines are being installed as stand-by or for emergency service, it is obvious to us that many more such installations as this by Ohio Bell could and should be made.



This Fairbanks-Morse opposed-piston 525 hp diesel engine provides standby protection for the Bell Telephone Company in Canton, Ohio. Foundation construction was eliminated by installing this light-weight engine-alternator unit on a subbase which is insulated from the basement floor by 8 rubber isolation pads. This view shows the Woodward governor, Air-Maze lube strainer, and Purolator lube filter.



The Ohio Bell Telephone Company office at Canton, Ohio. Within this building are serviced all calls made by the 61,722 telephones in the Canton-Glendale area. This office is also an important toll switching center.

List of Equipment

Engine	Fairbanks, Morse 525 hp, 7 cylinder O-P, 1200 rpm, Model 38F5¼ diesel
Alternator	Fairbanks, Morse 350 kw, Type TGZJ
Governor	Woodward
Lube oil cooler	Ross
Lube strainer	Air-Maze
Lube filter	Purolator
Fuel oil filter	Purolator
Fuel injection pumps	American-Bosch
Fuel transfer pump	Roper
Air filter	Air-Maze
Fuel oil	No. 2, Standard of Ohio
Lube oil	SOHIO Dieselube, XD-3
Starting air compressor	Gardner-Denver
Level meters	Liquidometer
Voltage regulator	Allis-Chalmers
Vibration dampeners	Manhattan Rubber Div.

INDIANA TOLL ROAD

By W. L. BODE



UNDER contract for two 14-mile strips of east and west bound lanes of the Indiana Toll Road stretching from Howe to Elkhart, Western Contracting Corporation of Sioux City, Iowa, nipped Jack Frost at the wire last winter with the completion of the 28-mile roadway. Backbone of the 7,600,000 cu. yd. earthmoving task were 10 Euclid TS-18 twin power scrapers teamed with four 388 hp Euclid TC-12 twin crawler tractors. The TS-18s are driven by Detroit diesel engines through Allison Torqmatic Drives, a CRT-5630 transmission-converter package in the front end and a TG-604 Torqmatic transmission and TC-654 Torqmatic converter in the rear end drive. The TC-12s are also driven by Detroit diesels, driving through a pair of Allison CRT-5530 Torqmatic transmission-converter packages. Normally working two 10-hour shifts, Western employed two TC-12s pushloading four TS-18s on two separate spreads. Two additional TS-18s were kept on standby.

Completion of the roadway came after a final two-week period of accelerated operations in a race against the arrival of winter weather. Shifts were increased to 11 hours and additional equipment was put into service to remove the frost and keep the earth workable. Temperatures continually dipped below freezing and fell to five degrees above zero during the last day and night of operation. Yet Western moved more than 30,500 cu yds of material and finished the job with three hours remaining on the last shift.

Western began work on the Indiana Toll Road in October, 1954 after successfully bidding on the 300-ft right of way from Howe to Elkhart. The sandy composition of the earth, weighing from 3300-3500 pounds per cu. yd., posed a serious problem. Operation of conventional drive scrapers and tractors was slowed down considerably in the borrow pits. Thus with time of utmost importance, as it is to all roadbuilders, Western turned to powerful and modern equipment to augment its present conventional drive vehicles on the strip. Already familiar with the performance of the Euclid's heavy duty off-highway equipment, Western purchased and received delivery in April, 1955 of 10

A Euclid TS-18 twin power scraper prepares to drop its load during roadway construction on the Western Contracting Corporation's Indiana Turnpike project. The TS-18 is driven by Detroit Diesel engines through Allison Torqmatic Drives, a CRT-5630 transmission-converter package in the front end and a TG-604 Torqmatic transmission and TC-654 Torqmatic converter in the rear end drive.





Normally self-loading vehicles, the TS-18s were pushloaded in the borrow pits by Euclid TC-12 twin crawler tractors due to the extreme sandy composition of the soil.



Constantly on the move, the TS-18s stopped only twice a day for refueling and once for grease at portable field shops. Robert Poorman (left), Allison service representative, discusses transmission operation with Western driver, Russell Bighams

Euclid TS-18 scrapers and four Euclid TC-12 tractors. Western has used the Euclid-Allison combination in great quantities on such projects as the Fort Randall, Oahe, and Gavin's Point dams in South Dakota; the Ohio Turnpike and Boeing landing strips in Wichita, Kansas.

The new vehicles proved to be the answer to the sand problem. "The Allison Torqmatic Drive permits the transmission of sufficient power—smoothly applied to keep us rolling—a necessity in road-building," asserted Jack Leppard, the Western general superintendent. "Torqmatic Drive gave us more rear drive traction, especially needed on this heavy sand," he added.

Weighing 35 tons unloaded, the TS-18s were fitted with sideboards to increase the normal 18-yd. struck capacity to 24.4 yds. Push-loaded by the 58,000-lb. TC-12s in the borrow pits, the TS-18s traveled to the roadway at speeds better than 25 mph and returned unloaded at 30-35 mph. Including time in the borrow pit, one scraper averaged 13.6 mph on a 10-hour shift. With length of hauls averaging 3,000 ft one way but sometimes exceeding 7,000 ft, the scrapers averaged 10 loads per hour from April to November of 1955 and reached a high of 14.2 during a one week period. Constantly on the move, the vehicles stopped only twice a day for refueling and once for grease at portable field shops. A central shop is maintained for major repairs and overhaul. In spite of the heavy sand and inclement weather conditions, earthmoving production in excess of 55,000 cu. yds. per day and one million for a monthly period was achieved. Allison Torqmatic Drives have operated at an average of 2600 hours in the TS-18s with a bare minimum of difficulty, according to Lewis A. (Shorty) Martin, Western's master mechanic. Compared with the family automobile, this is the equivalent of 78,000 miles of transmission life over normal highway travel. "Also the converter allows us to use a constant rpm engine. And, at a constant rpm, we get longer engine life."

"The drivers were especially pleased with the handling of the Torqmatic-equipped vehicles," Mr. Leppard pointed out. "The transmission of smoother power automatically made the difference between a difficult job and an easy one and there were far fewer complaints of sore hands previously due to constant shifting in the heavy sand."

Western has been finishing up this Spring and Summer their project which involves sections 33-41 of the Indiana turnpike. Sections 38-41 were 98 per cent completed and sections 33-37 were 60 per cent completed before the Winter downtime period. The entire project, including both east and west lanes of the 28-mile highway and two interchanges, totals 60 miles of pavement. Western's contract specifies concrete lanes 24 ft wide and 10 in. deep with two shoulders of asphaltic concrete. The inside shoulder is eight ft wide and three in. deep with the outside 10 ft in width and also three in. in depth. The sub-base for the concrete lanes is six in. in depth and for the shoulders it measures 13 in. Inside the shoulders is a median strip 40 ft in width. Seeding of the median is a Western responsibility. The remainder of the right of way includes roadway fill embankment, through cut sections and ditches. Embankment sub-grade must consist of 15 per cent or more gravel. The total width of right of way worked by Western over the 28-mile project will average 250-260 ft. Another job that faced Western this Spring was the clean-up of the borrow pits. Selected on an economic basis with length of haul a prime factor, Western used 56 pits in completing the roadway. Contracted mostly from farmers, Western must return the topsoil on each pit, level grade for drainage and seed if the ground is not going to be returned to cultivation. Completion of the Western project and the entire toll road is scheduled for Sept. 15, 1956.

Allison service representative, Robert Poorman (right), points to the Allison CRT-5630 Torqmatic transmission-converter package behind the massive front right wheel of the TS-18 while discussing maintenance procedures with Western field mechanic, Hollis Lacefield.



DIESEL SHIPS
EASTERN AND *WESTERN*

By ARNOLD B. NEWELL

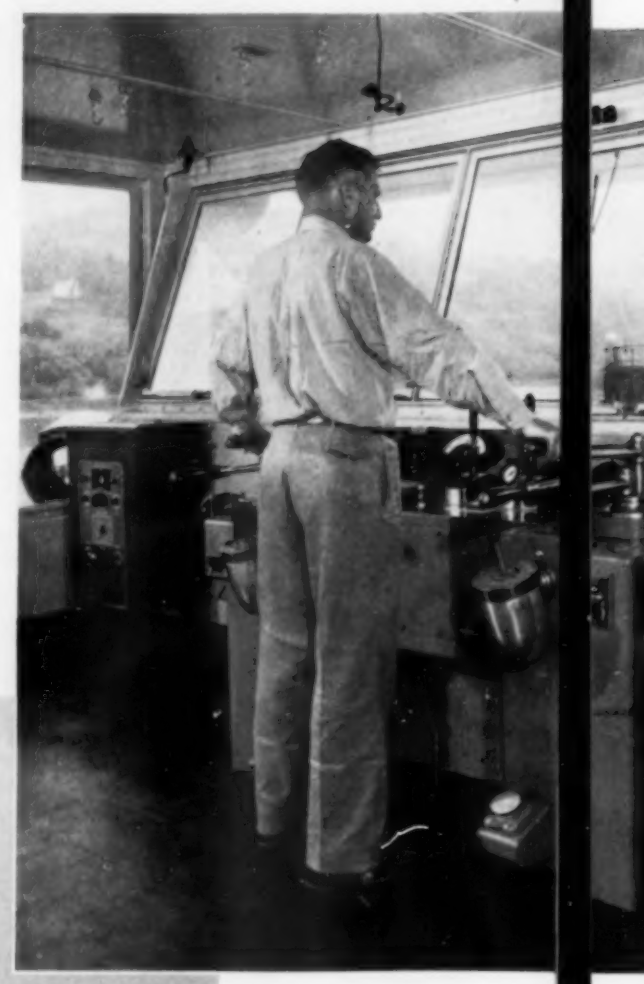
TWO of the most magnificent towboats of modern times have been added to the great fleet of diesel driven vessels flying the house flag of the Union Barge Line. These boats are the *Eastern* and the *Western*, sister ships to the *Southern* completed three years ago. All three vessels are to the design and construction of the Dravo Corporation of Pittsburgh. The owners operate on the Ohio and the Mississippi Rivers and on the Gulf intracoastal canal as common carriers with a huge fleet of towboats and barges.

From time to time in the past it has been my pleasure to inspect the motor vessels of many kinds built by Dravo, and it always seemed to me that the builders were not only leaders in design and construction techniques, but they succeeded in producing vessels at once combining the highest degree of operating efficiency and the finest living quarters to be found afloat anywhere. All of these qualities are fully reflected in these two splendid new vessels. Principal dimensions are Length oa. molded - 166 ft, Beam - 36 ft, Depth at side - 11 ft 2 in.

They have double deckhouses with pilothouse on top of the upper deckhouse. The total height from keel plate to pilothouse top is 40 ft. The draft varies somewhat with changes in tonnage of fuel and supplies carried but it does not exceed 8 ft 2 in. when fully outfitted and loaded with approximately two-thirds of total fuel capacity.

The machinery installation while not the most powerful on the Great Rivers is one of the most interesting. Needless to say it is neatly and properly done with ample space for all phases of operation and the maintenance work. The main propulsion engines are two Superior diesels made by the White Diesel Engine Division of the White Motor Company at Springfield, Ohio. They are 8-cylinder, 4-cycle, of trunk-piston type turbocharged and undirectional in operation. These engines have intake air coolers and after coolers. The pistons are oil cooled. Each unit is rated 1750 hp @ 600 rpm. Engine equipment includes Alnor pyrometers, Ross heat exchangers, Maxim exhaust silencers and Air-Maze air filters and air silencers. Engineroom instrument board is by Lakeshore Electric. A matter of considerable interest is the fact that the engines are equipped with the first Hindmarch-DeLaval reverse and reduction gear sets manufactured entirely in the United States. They are a product of the DeLaval Steam Turbine Company of Trenton, N. J. The gear ratio is 2.7:1 in ahead operation and 2.6:1 working astern. This difference in ratio is very important in river work where tremendous backing power is needed, and in this case such power is increased about 15% over that of a standard type of gear. Pilothouse control of engine speed and direction of rotation is through the medium of Westinghouse Air Brake equipment which, incidentally is also the make used for steering control on the towboats.

Rounding out the picture of maximum propulsion efficiency are the Kort Nozzles shaped into the hull and completely encircling the 8 ft 2 in. diameter 4-blade propellors. The Kort Nozzle has the quality of actually increasing towline pull without increasing the demand for power on the engine and therefore without increasing the rate of fuel





consumption. Added to the inherently high overall efficiency of the power plants on the *Eastern* and the *Western*, these nozzles put the vessels on an extremely high level of towing power. An interesting design feature is the streamlined strut arrangement running from the hull structure aft to the Kort Nozzles enclosing the tailshaft bearings. The shafts at strut and stern tube bearings are coated with a 0.02 in. layer of ground and polished sprayed stainless steel, Metcoloy No. 2.

To the man on salt water the rudder system on a modern river towboat is something marvelous to behold. There are two steering rudders, one back of each propeller in the slipstream and four backing rudders—also called flanking rudders. On these vessels the rudders are controlled from the pilothouse with a Westinghouse Air Brake control system while the actual steering action is through hydraulic ram type steering gears with full follow up control and helm angle indicated by the position of the levers in the pilothouse. The pilot also, of course, has engine speed and direction of rotation indicated by electric tachometers before his eyes. The double ram steering gears operate on 365-400 lb oil pressure supplied from a central system. They can move the rudder from hard over to hard over in 13 seconds. Motor driven pumps supply the oil pressure. They start and stop Automatically at a pre-determined low and high pressure. The oil is cushioned on a bank of air in the central storage tanks.

The propelling machinery is located in the hold amidship. The aforementioned steering gear is in the hold aft and the forward hold is for gear storage. The machinery space is of course ample and the engine installation follows a well developed Dravo pattern. In a general way there are two complete propulsion power plants, each with its own pumps and other auxiliary requirements. Power to run the pumps, light the vessel and operate the electrical appliances including galley range is supplied by a pair of General Motors diesels driving Delco generators rated 100 kva, 220/240 volt, 3-phase 60-cycle ac and also a 20 kw, 115 volt dc generator as well as a 2.5 kw dc exciter. These generator sets are installed behind the main engines on the main deck level. The switchboard, instrument panel, log desk, etc. are also on the main deck of the vessel.

Fuel oil is carried in six tanks, four located forward of the engineroom and two aft. The fuel is clarified by a DeLaval 350 gph centrifuge complete with non-corrosive bowl, sight glasses for oil and water outlets, panel mounted pressure and temperature gauges and integral suction and discharge pumps. A single 12 gph Hilco lubricating oil reclaimer serves both of the main engines. There are two lube oil scavenging pumps and one fuel oil transfer pump.

To this correspondent who always worked in the engine room the modern pilothouse is nothing short of a nautical Pandora's box from which has escaped all navigational, if not human ills. This impression is augmented in the river boats by the double controls for engines and both sets of rudders, the searchlight, remote controls and the electronic devices. On the *Eastern* and *Western* the broad expanse of pilothouse window slopes to an angle of 20 degrees to reduce glare. The equipment includes a Sperry radar set, sound-powered telephone to engine room, ship-to-shore radio phone, alarm controls, tell tales and a small array of instruments to show what the machinery is up to. All told, these are vessels of extraordinary interest, destined to perform in a manner becoming the reputation of the builders and the makers of the machinery.



Slanting windows minimize glare in this modern pilothouse equipped with Sperry radar and Westinghouse controls for the power and the steering.



Engineroom of the *Eastern* at main deck level showing tops of the 1,750 hp Superior diesels which are equipped with Hindmarch-DeLaval reverse and reduction gear sets. Alnor pyrometer on Lakeshore Electric instrument board right rear. Young aftercooler can be seen on engine in foreground.

THE FREE PISTON ENGINE

What It Is, How It Works, Its Present Development And Future Possibilities

Two Part Article
Part 1

By J. W. BROWN*

SEVERAL large U. S. industrial firms (including Baldwin-Lima-Hamilton, Cooper-Bessemer, General Motors and the Ford Motor Company for certain) have lately shown renewed interest in the free-piston engine. Results being obtained in certain quarters, including actual installations in such widely varied vehicles as an American Dream Car and a U. S. Maritime Commission experimental Liberty ship make it appear that this 30-year-old engine, used as a gasifier in combination with gas turbines of more recent origin and design, could almost certainly have an important role to play in future development of industrial, marine and perhaps automotive power.

As evidence that the free-piston gasifier and turbine combination has progressed far beyond the drawing board stage in this country, the Cleveland Diesel Engine Division of General Motors has already delivered to the U.S. Maritime Commission six 1250 gas hp units which will produce, after deducting piping and turbine losses, a total of 6000 shaft hp. These units will power the *S. S. William Patterson*, a modernized Liberty ship. They will occupy less space and weigh about 80 tons less than the original 2500 ihp propulsion engines. Also, as another outgrowth of the General Motors research into this form of power, GM President Harlow Curtice announced at the May dedication of the new General Motors Technical Center that successful application of a 250 gas hp version of the free-piston engine was made in the XP-500, an experimental auto set aside for the purpose.

Both of these General Motors installations have received sufficient laboratory pre-testing to assure that they will work and (considering the relatively short developmental time) on a very satisfactory basis. The GM-14 engines (as the six that will be installed in the Liberty ship are designated) are an outgrowth of months of testing and improvement on the original GM-14 still at General Motors Research Laboratory. The work was done under license from Sigma, a French concern holding the original patents. On a recent test, the GM-14 experimental engine ran 4,500 hours full load on Bunker C fuel without any emergency stops, without a change of cylinder liners or pistons and with fuel economies that indicated an over-all (gasifier and turbine) thermal efficiency of about 37%. Asked about reported troubles some others had had with liners, A. F. Underwood, head of the Mechanical Development Department, General Motors Research Staff, said: "If we have had less trouble than some others with pistons and liners, I would attribute it to the fact that we operate this engine at lower pressures and do not build up as much destructive heat."

The U. S. Maritime Commission installation plans were described in a June 6, 1955, paper by John J. McMullen, Chief, Office of Ship Construction and Repair before the Oil and Gas Power Division of The American Society of Mechanical Engineers. The XP-500 automotive installation of the smaller GM 4-4 engine was described in a paper given by General Motors' Mr. Underwood on June 5, 1956 at the Atlantic City, N. J. meeting of the Society of Automotive Engineers. At this S.A.E. meeting Gordon Millar, a Ford Motor Company engineer extemporaneously revealed that Ford has also been engaged in free-piston automotive engine research for some time.

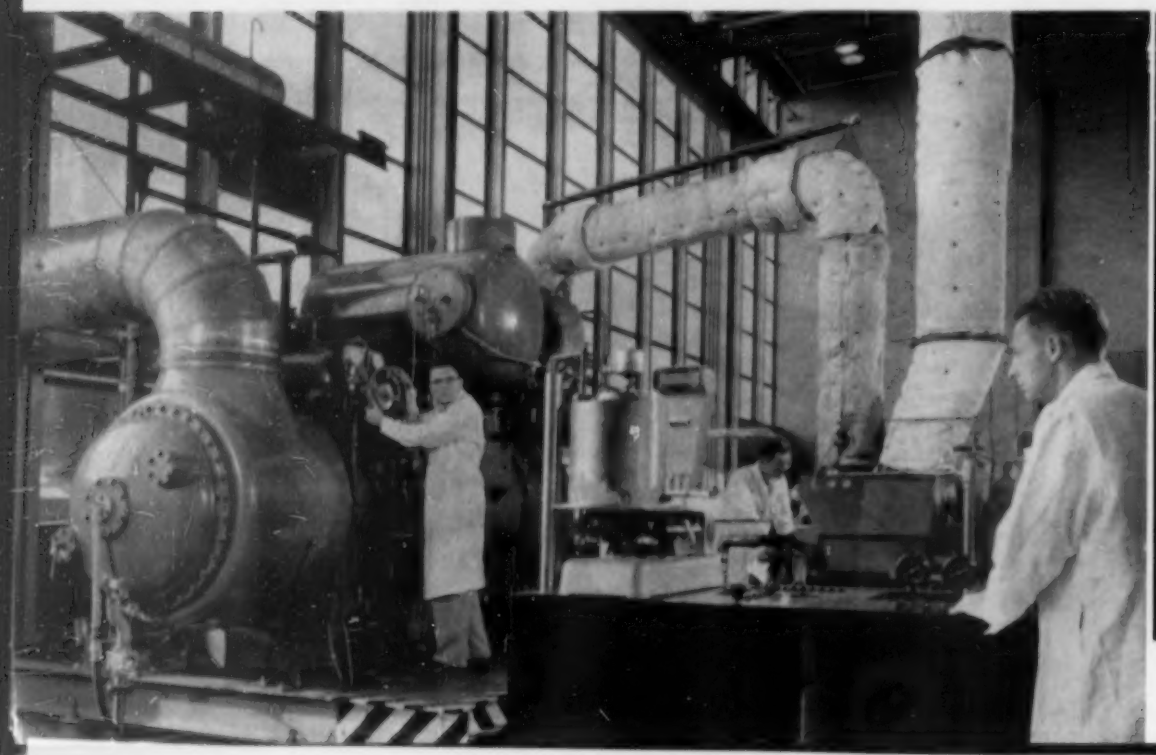
The so-called free-piston engine is not new, nor is its use to drive vessels in large (approximately 1000 hp) units new. The development dates back some 30 years, but it is only quite recently that ways have been found to make the engine more economical under part-load conditions. This vastly improved its over-all economy. Other than in portable air compressors, the marine usage mentioned above was the only commercial application, and most of those used were of European origin.

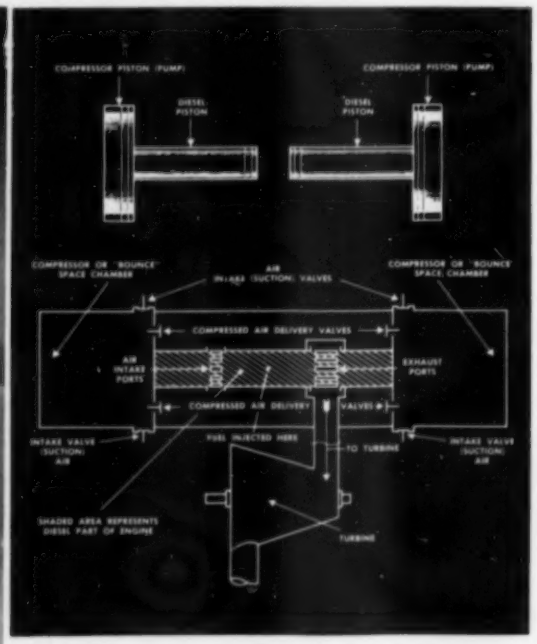
The term Gasifier used in connection with the free-piston engine means that the only justification for feeding fuel to the engine is to manufacture gases which in turn are used to propel a turbine from which the actual shaft power is taken. As a

*Detroit Editor *DIESEL PROGRESS*

Designed for ship propulsion or power station operation, this is GM-14, a free piston gasifier that was displayed at the May 16 dedication of General Motors Technical Center. It is similar to six gasifier units GM's Cleveland Diesel Engine Division is building for the U. S. Maritime Administration for trans-Atlantic service in the *SS William Patterson*. The GM-14, rated at 1250 gas hp, operates at approximately 600 cycles, per minute, full load.

Fig. 1





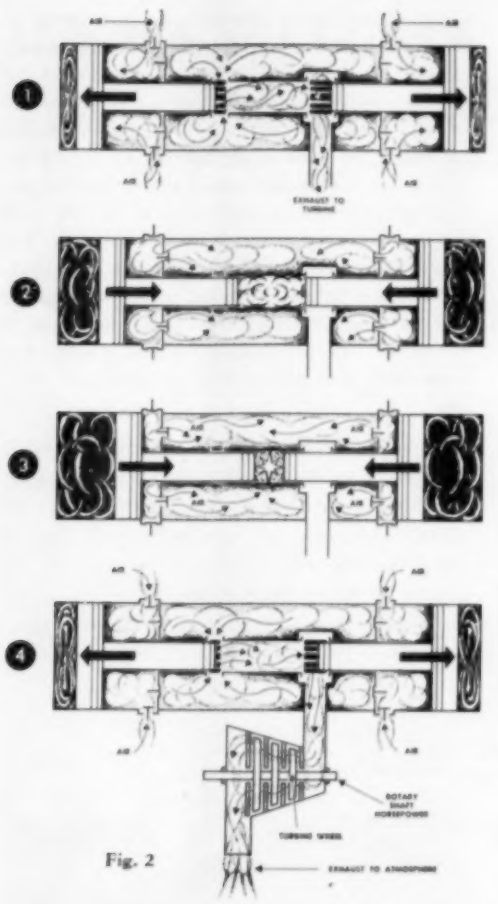


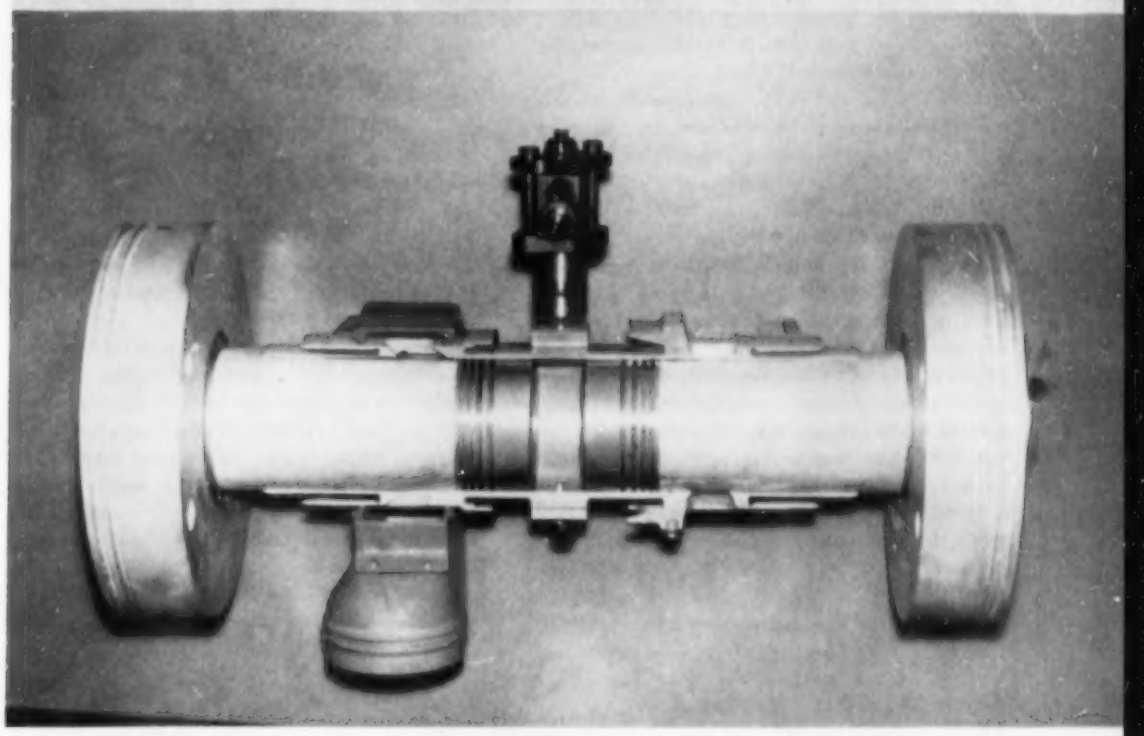
Fig. 2

gasifier, the free-piston engine replaces the compressor and combustion chamber of the usual gas turbine engine. This might seem to be a roundabout way to get fuels turned into expanding gases, and it would be, except for two reasons. One is the fact that the free-piston engine can be operated at very high (from 30:1 to 50:1) compression ratios resulting in highly efficient combustion of almost any fuel, and the other is that the free-piston engine as a gasifier has character-

Unretouched view of the combustion piston from the scavenging end of the cylinder of the GM-14 experimental engine after a 4500-hour, full-load test run, using Bunker C fuel.



THE HEART OF THE FREE PISTON ENGIN



General Motors cut-away showing the opposed pistons of a free-piston engine. In the center is the fuel injector, to the right of that the combustion cylinder intake ports and to the left the combustion cylinder exhaust ports leading into the exhaust manifold.

istics that result in advantageously lower turbine temperatures and pressures.

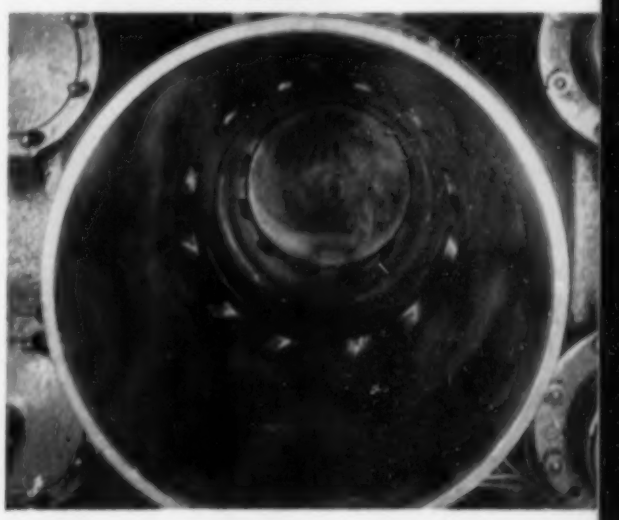
The GM-14 free-piston engine, as one example of free-piston design, bears a distinct family resemblance to a single cylinder, opposed-piston 2-cycle diesel engine. The chief differences are as follows: 1. Each of the two combustion pistons (Fig. 1) are directly and concentrically attached to larger air-compressing pistons for which they furnish motivation. 2. Instead of using a crankshaft, flywheel and connecting rod to return the combustion pistons toward each other (and against combustion cylinder compression) they are returned by the energy stored in the compressed air in bounce chambers during their outward travel. 3. The inward face of the air-compressing pistons pump air under pressure into an air box or scavenging air chamber, completely eliminating the more round-about method of scavenging by a blower. 4. Since the air pressures in both the bounce chambers and the air compressor chambers can be varied at will along with fuel input and stroke, far higher and more efficient combustion pressures can be obtained than in other diesel engines.

There are other outstandingly apparent advantages of the free-piston gasifier and turbine combination which will be mentioned later in this article.

We believe examination of Fig. 2 will make the usual four phases (intake, compression, power, exhaust) of the combustion cycle fairly obvious to any who have made the slightest study of 2-cycle diesel operation. The engine is started by spilling compressed air suddenly from a small accumulator into both bounce chambers. Since there is no flywheel or other rotating mass to resist acceleration, the engine assumes the speed for which the fuel input and bounce chamber pressure is set almost immediately. It almost jumps into action.

In Fig. 2, Illustration 1 shows the pistons completing their outward travel on the first power stroke. At this point intake air is rushing into the power cylinder and mingling with the remaining exhaust gases which are passing on toward the turbine. During this instant the cylinder is scavenged. Illustration 2, Fig. 2 shows the pistons bouncing inward on the compression stroke. Note that the air compressing pistons are pumping air into the scavenging air chamber where it will remain under pressure until the intake ports (into the combustion chamber) are again exposed. Fig. 2, Illustration 3 shows fuel being injected and starting to burn near the innermost point of travel of the pistons. As soon as the pistons reverse

Scavenging end of the cylinder liner of the GM-14 free-piston engine that ran 4500 hours on Bunker C fuel without trouble.



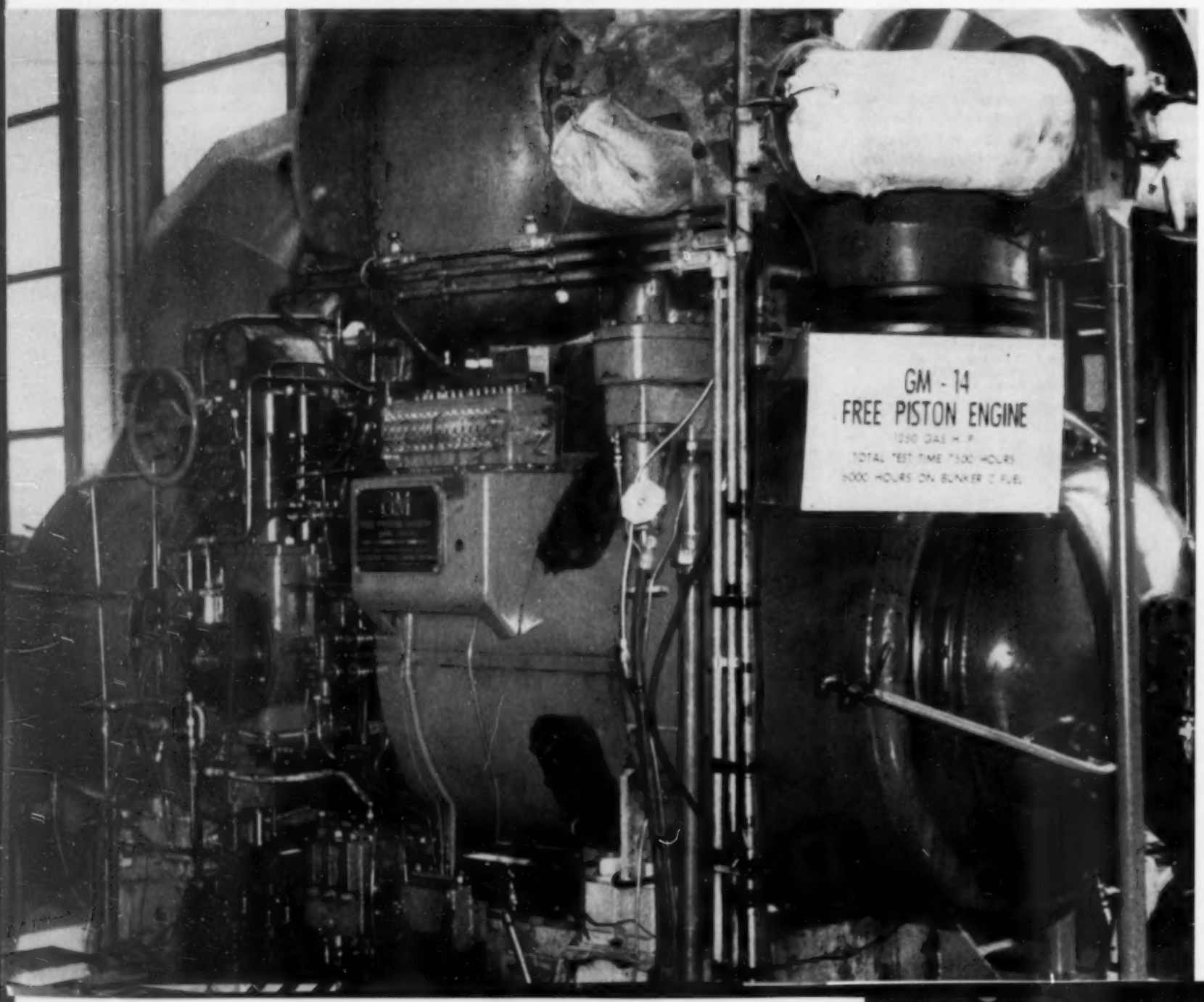
direction on the power stroke, compressed air is trapped in the scavenging air chamber and inlet valves open to start refilling the air compressing chamber. Illustration 4, Fig. 2, diagrams the instant before the end of the power stroke. This is the exhaust phase of the cycle, and the beginning of the intake or scavenging phase. Hot, expanding exhaust gases are pushing out of the exhaust ports into the manifold which leads to the turbine from which usable rotation power is taken. Throughout this half of the cycle air is again being drawn into the compression chambers at the inward faces of the air compressing pistons.

Injection of fuel in the free-piston engine follows much the same pattern as in any diesel. For simplification of the illustrations no attempt has been made to show the fuel-pumping and injector-operating mechanisms. This is where the description of the pistons as being free breaks down. Free refers to the variable stroke of the pistons. The pistons are actually connected by rods which operate through stuffing boxes in the compressor chamber walls. The purpose of this is two-fold; first to provide just enough restraint to keep any frictional disparity from allowing one piston to travel farther or faster than the other (in which case they would get out of phase); second, to provide actuation for the fuel injection pump. Since the pistons are moving in opposite directions at all times the connection is made through rods or linkage forming a parallelogram. The fuel pump is mounted at the center of the engine and is driven by a cam operated by this linkage; in the GM-14 it simultaneously serves six injectors spaced around the periphery of the combustion chamber.

As in other opposed-piston diesels, intake and exhaust valving of the combustion cylinder are accomplished by ports around the cylinder liner wall, so placed as to be covered by the pistons and sealed off by the piston rings during most of the combustion cycle. Valves for the compressor cylinder are of the simple reed type and are constructed by stacking and bolting together a number of die castings and thin metal stampings. Design of the parts is such that the metal reeds can allow passage of air in only one direction. (An exception to this is the exhaust valve set-up of the GM-14 engine wherein disc type compressor exhaust valves are used.) Since lubrication of the GM-14 is almost completely confined to lubrication of the cylinder walls (there being no crankshaft or connecting rods to be lubricated) the design follows the traditional steam-cylinder one-shot method with mechanical applicators so that the oil is consumed as needed and is not recirculated. The power pistons are cooled from beneath their working surfaces by a continuous jet of oil supplied through pipes running from the outer ends of the bounce chambers through to the pistons. The same oil is used to lubricate the linkage.

The power cylinders and the compressor cylinder air-delivery valves are water-jacketed in the conventional manner and cooled by recirculated fresh water. This could be done either with heat exchangers or by keel or skin cooling systems. According to Mr. McMullen's paper the 1250 gas hp engines for the *S. S. William Patterson* will require only about 100 gpm each of cooling water.

Experimental Free Piston engine that was displayed in the research building at the new GM Technical Center. Card on the engine reads: "GM-14 free piston engine, 1250 Gas hp; total test time 7500 Hours (6000 hours on Bunker C fuel)."

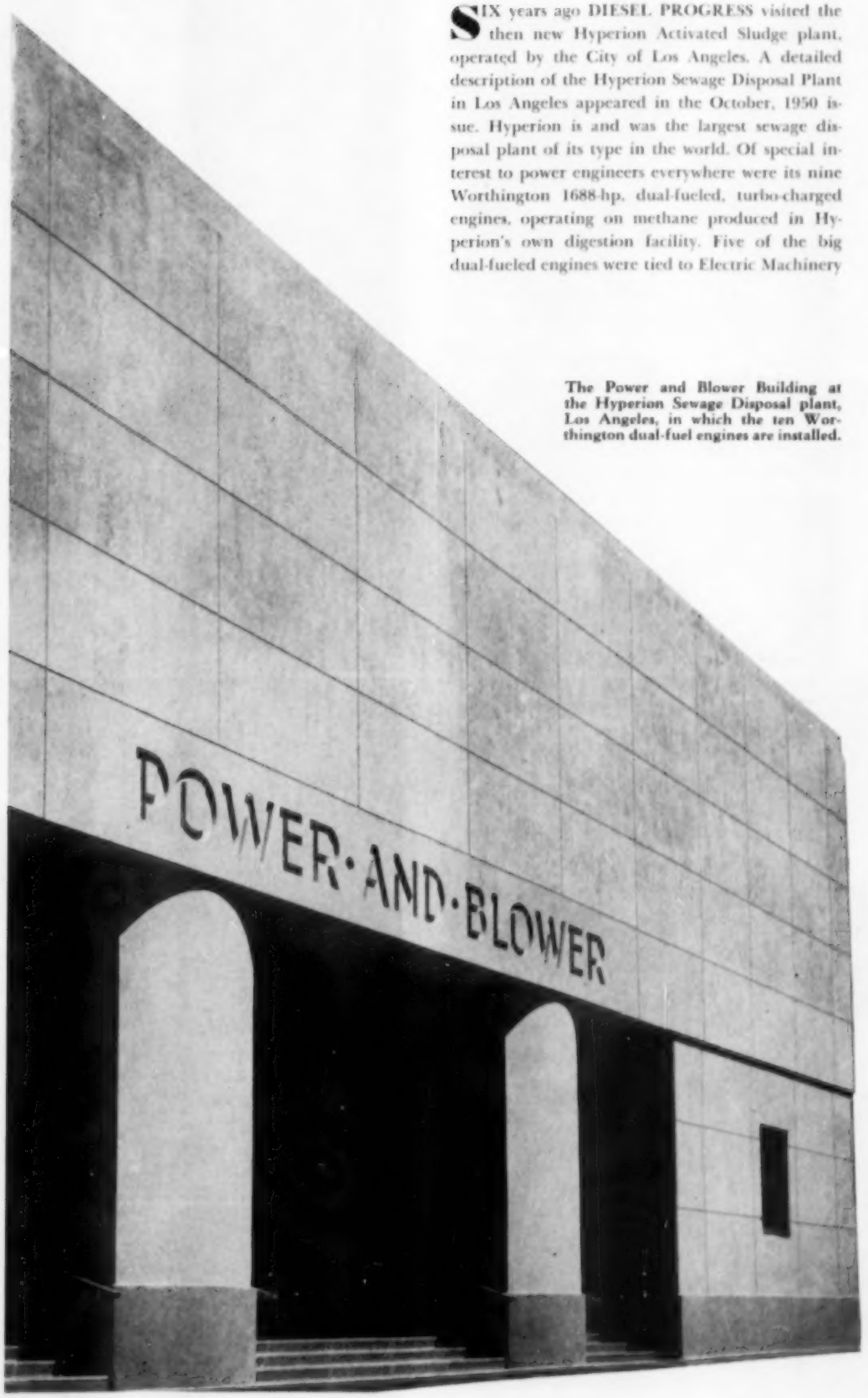


HYPERION'S SIX YEARS OF OPERATION

Hyperion's Six Year Operational Record Stands as Monument to Good Maintenance.

By JAMES JOSEPH

SIX years ago DIESEL PROGRESS visited the then new Hyperion Activated Sludge plant, operated by the City of Los Angeles. A detailed description of the Hyperion Sewage Disposal Plant in Los Angeles appeared in the October, 1950 issue. Hyperion is and was the largest sewage disposal plant of its type in the world. Of special interest to power engineers everywhere were its nine Worthington 1688-hp. dual-fueled, turbo-charged engines, operating on methane produced in Hyperion's own digestion facility. Five of the big dual-fueled engines were tied to Electric Machinery generators, producing electricity enough to make Hyperion independent of outside power sources. Four of the engines powered DeLaval centrifugal blowers, each with capacity of 40,800 cfm, the air used for sewage aeration. In 1954, a 10th unit was added. This is a blower unit and was made necessary by the ever increasing use of detergents for washing clothes and dishes. The detergent reduces ability of the effluent to dissolve oxygen, therefore more free air is required to activate the sludge.



The Power and Blower Building at the Hyperion Sewage Disposal plant, Los Angeles, in which the ten Worthington dual-fuel engines are installed.

Now, six years later, Hyperion reports one of the most outstanding operational records in sewage treatment and engine operation. With an average 30,554 hours on its 9 original engines (a 10th blower unit was installed in 1954), the plant reports that during 6 years' operations it has not worn out a piston ring, cylinder liner or bearing.

Worthington engine #7, which was first on the line, is perhaps typical. This engine has operated 38,367 hours. Yet it is still running with original rings, bearings and liners. In April, 1955 engine #7 (which powers a blower), got a routine overhaul after 8400 hours. Here are a few of the findings: (1) Cylinder liner wear at top of liners averaged .005 in.; at midsection, .0035 in.; at bottom, .0025 in. (2) Pistons and rings were judged in excellent condition by maintenance engineer's inspection. Nowhere was wear greater than .003 in. (3) Bearings—the engine's originals—averaged only .002 in. wear, and required neither removal nor adjustment.

As for Hyperion's other engines, here are run-times to date, from mid-May, 1950 through May 1, 1956:

	Hours
Engine #1	28,928
Engine #2	31,163
Engine #3	26,926
Engine #4	30,422
Engine #5	25,648
Engine #6	34,472
Engine #7	38,367
Engine #8	33,785
Engine #9	33,753
Engine #10	10,435 (installed Oct. 1954)

Hyperion maintenance engineers say they will be very disappointed if they don't get 100,000 hours per set of rings on Engine #7. And they believe this a typical Hyperion engine. They also expect perhaps double this life per cylinder liner. Behind so impressive a record stands Hyperion's maintenance department and also, some innovations.

Since 1953, the plant's operating staff has treated all rings and pistons at time of over-haul by the Parco Lubrite process. Whereas pre-Parco, Hyper-

ion lost about 15 liners through scoring, it has lost only one since adopting the process. The Parco Lubrite process is a method of reducing wear on bearing surfaces and it is a product of the Parker Rust Proof Co. Hardening of neoprene liner lower end seals was another problem. Neoprene seals hardened under the high temperatures of vapor phase operation (jacket water enters engines at about 248-degrees, exits at about 253-degrees). For months, Hyperion staffers tested one type seal after another. They ran operational tests on silicon seals, from low to high-temperature types. They experimented with synthetic rubber seals. But, like both neoprene and silicon, the synthetic seals work-hardened. Finally, tests of polyethylene seals proved this type best for Hyperion's high-temperature operation. The plastic remained soft and pliable despite temperature extremes. Today, all Hyperion engines are installed with polyethylene seals.

The vapor phase system of high temperature cooling, a product of the Engineering Controls, Inc., of St. Louis, Mo., has contributed so much to the success of the Hyperion Plant that we requote from the October, 1950 issue the details of this, the largest vapor phase installation in service.

All steam required comes from the vapor phase engine cooling and waste heat recovery system. Up to 95 per cent of the fuel used by the ten dual-fuel engines is being produced by the sludge digestion process; and the engine heat supplies all heat for the sludge and other requirements around the plant. The engine heat is recovered in the form of low pressure steam. A still further saving is made by injecting the live steam directly into the sludge digesters. By this method, the engine heat is transferred to the sludge for heating, thus accelerating disintegration. Seven of the engines are equipped with Maxim exhaust heat recoverey silencers of the water heater type and operate as follows as shown at the right in figure 1:

The vapor phase unit A, one for each engine, has a built-in steam separator and sedimentation chamber. Engine pump B circulates the cooling water from A through the engine, absorbing the heat rejected to the jackets, then passes through C, the exhaust water-heater, where about 50 per cent of the heat rejected to the exhaust is absorbed, then enters A tangently, causing the water to swirl in the unit where the engine heat is flashed to steam. This centrifugal action separates the steam, air and solids from the water, allowing clean, airfree water to return to B, repeating the cycle. The steam passes to D, the low pressure header, where it finds its way to the sludge digesters. Any sediment contained in the water is collected in the chamber at the bottom, where it is blown down as hereafter described.

As all steam used in the sewage treating process has to be replaced, 100 per cent treated water make-up is supplied by softener F. The cold water make-up enters the engine supercharger G, where temperature is controlled to a maximum of 180°F. by a Fulton Sylphon thermostatic by-pass valve H, passing then to unit A, and entering it at point I, where it mixes with the boiling water circulating through the engine system to 800 gpm. The amount of water required to cool the supercharger is in the order of 6 gpm more than required to replace the water that has been used as steam. This surplus water builds up in A until it is even with level float J, which then automatically operates blow-down valve K, allowing the surplus to flow through line E to the plant effluent header L, the low level float M then automatically closes valve K, and the cycle is repeated. Steam for plant heating is taken off of the header D through a 3-in. line N. As less heat will be required for the digesters in summer the circulating water is by-passed around the exhaust water heaters through line U, thus any number of exhaust heaters can be used to maintain steam production to the amount required.

Each vapor phase unit is equipped with safety controls, including a high and low water alarm switch, that flashes an indicating light on the engine panel control board, a pressure gauge P, air vent valve Q, and two steam pressure relief valves R. The steam line connecting each vapor phase unit with

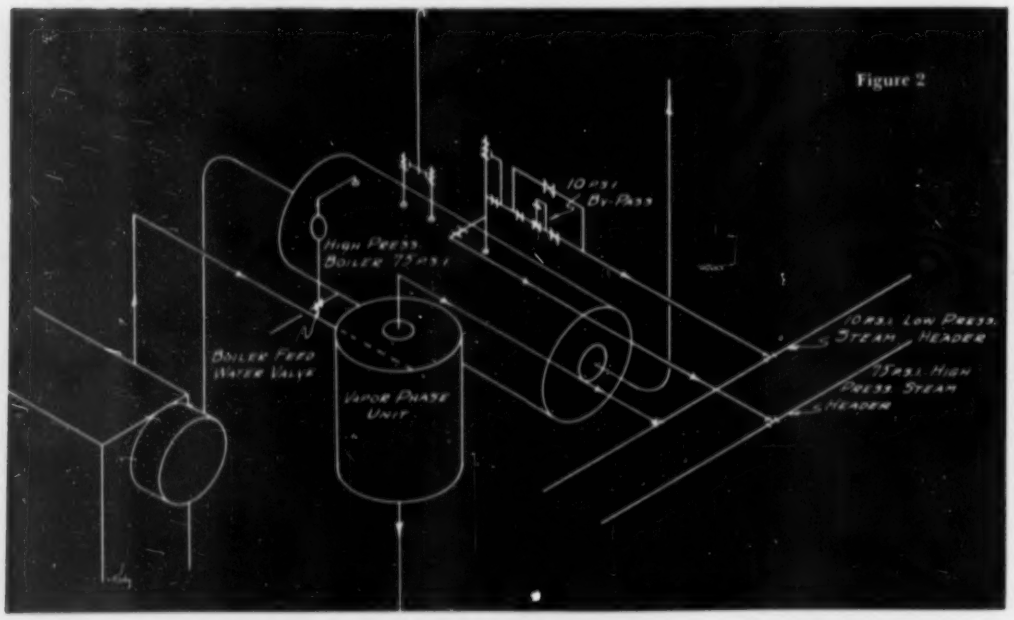


Figure 2



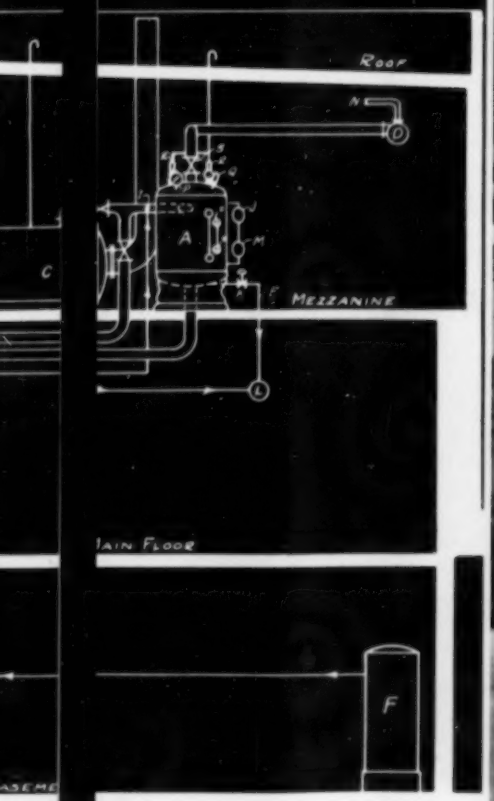
the header D is provided with a valve, S, which may be turned off and the engine system drained through valve T for servicing the engine. When any engine is temporarily shut down valve S is left open, admitting steam from the header to flow back into the vapor phase unit; and, by running pump B occasionally, the idle engine is kept up to temperature indefinitely.

Two of the engines are equipped with Maxim exhaust heat recovery silencers of the high pressure steam type. These boilers illustrated in figure 2 supply steam at 75 psi for plant use and when this quantity is not required the pressure is reduced to 10 psi for sludge heating. These boilers have separate controls and a feed water pump. The engine lubricating oil is cooled to 135 degrees by a separate stream of the effluent which mixes with the engine cooling water blow-down, and this hot water is used around the plant. The constant temperature vapor phase system has advantages other than waste heat recovery, namely, elimination of condensation, a product of combustion, within the cylinders. The absence of condensation and resultant acid greatly reduces wear (corrosion) in cylinders and extends lube oil life.

The five engine-driven Electric Machinery generators which produce enough power to make the plant completely independent of outside lines. Each unit is rated at 1,486 kva., 1,189 kw., 3 phase, 60 cycle, 4,800 volts.

Four engine-driven DeLaval Centrifugal blowers to which an additional engine and blower have been added since this photograph was taken. The five units supply the aeration for the sewage treatment.

Fig. 1



Hyperion operating engineers are proudest, perhaps, of a shop-fabricated maintenance machine which salvages injector nozzles with stuck needle valves. Previously, during its early operational years, the plant had sent some three dozen nozzles out for repair—almost always because of stuck needles. And just as often the nozzles were returned with the recommendation that they be scrapped. It seemed impossible to work the needles free, but a nozzle tip assembly was priced at about $56. So Hyperion staffers, forever cost conscious, decided to experiment. Solution came with a Hyperion-fabricated, air-operated shotgun—the needle valve holder screwed into an assembly, the assembly inserted in a length of a 2-in. Selby tubing—and shot under 28 psi air down 8-ft of tubing. The assembly projectile hurtles down the tube, is stopped instantly when it hits a steel plate. Something has to give and almost always it is the needle that comes loose. Currently, Hyperion staffers are salvaging about 75 per cent of their nozzles in this manner. Only about 25 per cent of the needles are broken by impact. Plant maintainers are working now to eliminate even this loss. This shop-fabricated device has been instrumental in reducing one bothersome maintenance expense.

Another saving has come because Hyperion fabricates its own needles. The job requires about an hour of machine time. Another two hours are needed to lap the needle into place. With a total 3 hours invested, Hyperion is able to repair stuck nozzle assemblies for $10-$12. This is about $40 below the cost of replacing the entire unit. Hyperion has installed a Merlin Service Master for this work. The machine also grinds and laps injectors. Meantime, the plant is readying for a sizable expansion. Already authorized by a $60,000,000 bond issue is expansion of facilities both at the plant and in its feeder sewer systems. Expansion is necessary because of Los Angeles' very rapid growth during the past six years.

In the engineering stage is a 5-mile effluent line which will parallel the plant's present one-mile, 12-ft diameter ocean outfall line. The proposed five-mile effluent line will be 12-ft in diameter and of concrete construction. It will increase the plant's maximum effluent capacity to an estimated 420,000,000 gals/day (compared to the present 250,000,000 gals/day). The new line will reduce treatment, cut costs, mean a 70 per cent increase in effluent capacity. Effluent from the treatment facilities will be pumped to sea through the new line. Outside power will likely be required for this purpose. Also part of the planned expansion is a seven-mile long, ocean-going sludge line (probable size: 20-in. diameter) which will carry some 2,000,000 gallons of digested sludge daily. The line, as now proposed, will terminate at an undersea canyon—a deep depression some seven miles seaward from Hyperion. Sludge will readily settle into this natural under-sea basin.

Originally, Hyperion cost about $45 million, but the investment has been many times repaid, not just because Los Angeles sewage is now treated by the most modern methods, but because miles of beaches, once condemned as unsafe for swimming, have been reopened. The lifting of the beach bans remains today, one of the plant's most noteworthy achievements. As a matter of fact, one of the most populous beaches in the Los Angeles area lies just across Pacific Coast Highway from the treatment plant. Yet six years ago, this beach was deserted. Swimming was prohibited. Today, with Hyperion operative, the beach has been restored to useful, recreational purpose.

Another Hyperion Project—a joint effort with Los Angeles County's Flood Control District—is water reclamation. Reclamation is all-important because Los Angeles is drawing increasing quantities of water from its underlying water table. More fresh water is being withdrawn, in fact, than normal rainfall can replenish. So a serious problem has developed. Salt water is gradually moving in, replacing fresh water with brine. And thus, threatening at least one segment of Los Angeles' water resources. For several years the Flood Control District has been experimenting at some eight injection wells perimetering the coast. Engineers hope to resupply the falling water table, hold back the intrusion of salt water. The District, through a pilot injection plant newly installed at Hyperion, is using effluent as one source of resupply.

Hyperion is supplying about 3,000,000 gallons of effluent daily to the project. And, if the experiment proves successful, the treatment plant may one day be playing a major role in water reclamation. For currently available are 250,000,000 gallons of effluent each day, and most of this is being piped out to sea. Recharging the dwindling water table is but one of the plant's newer projects. There are prospects that effluent may also find new uses by industry and agriculture in water-short Southern California, bearing in mind that the effluent is so treated as to be purer than existing city water.

Meantime, Hyperion continues as a self-sustaining operation. Its 10-turbo-charged SEHGO-8 Worthington dual-fueled engines burn Hyperion-produced methane. Some 558,552,000 Btu of methane—produced by digestion of solids removed from sewage—went to fuel the engines last year. In addition, the engine-powered generators produced 21,773,645 kwh of electricity; and blowers, also engine-powered, produced some seventy-three billion, three hundred and seven million cu. ft of air. This air was used internally for sewage treatment. Moreover, during 1955, the plant averaged 7912 rated bhp hours per gallon of lube oil. The same oil lubed gas compressors, instrument and starting air compressors, engine turbochargers, governors and outboard bearings.

This six year operational record is a factual demonstration of dividends earned and paid by good maintenance, good equipment, and imaginative thinking which not only produced savings by the plant operators' own innovations but took advantage of new developments like the Parco Lubrite process and polyethylene seals.

The plant is operated by the Bureau of Sanitation, City of Angeles, under direction of Warren A. Schneider. G. A. Parkes is chief engineer. James Glavin is chief diesel plant operator.

List of Equipment

Pyrometer—Brown Instrument Co.

Governors—Woodward Governor Co.

Lube Oil Coolers—The Sims Co.

Turbochargers—Elliott-Buchi.

Generator and Exciter—Electric Machinery Mfg.

Centrifugal Blowers—DeLaval Steam Turbine Co.

Lube Oil—Shell Oil Co.

Lube Oil Centrifuges—The Sharples Co.

Lube Oil Meters—Buffalo Meter Co.

Lube Oil Filters—Hilco.

Fuel Oil Filters—Hilco.

Fuel Oil Centrifuges—Sharples Co.

Vapor Phase System—Engineering Controls, Inc.

Intake Air Filters—American Air Filter Co.

Impingement Air Filter—Continental Air Filters.

Intake Air Filters on Engines—American Air.

Exhaust Heat Boilers and Silencers—Maxim.

Mercoid Controls—Detroit Controls Corp.

IMO Pumps (Lube Oil)—DeLaval Steam.

Lubricators—Manzel Inc.

Valves—Crane Co.

Volume Regulators on Blowers—Askania.

By-pass Valve—Fulton-Sylphon.

Flexible Connections—Zallea Bros.

Fuel Oil Filters—Cuno Engineering Co.

Three hours of shop time (some of it on this Merlin centerless grinder) and Hyperion has shop fabricated an injector needle.



AMERICAN M. A. R. C. TAKES OVER HALLETT ENGINES

AMERICAN M. A. R. C., Inc. purchased the diesel engine division of the Hallett Manufacturing Company as of March 31, 1956, and are continuing manufacture of the complete line of Hallett engines at the same location in Inglewood, California. American M. A. R. C. retained all of Hallett's key personnel in the diesel division, and production and sales have continued without interruption. American M. A. R. C., Inc. is a Pennsylvania Corporation, and in addition to purchasing the Hallett engines, they have taken over the diesel engine designs of Diesel Power, Inc. of Pennsylvania.

The President of American M. A. R. C. is Mr. W. Denis Kendall. Mr. Kendall has had wide and long experience in the automotive and engine manufacturing fields. Prior to joining American M. A. R. C. he held high positions with the Citroen Motor Company, France; British Manufacture & Research Company, England; Mack Manufacturing Corporation, Pennsylvania; Gerard Machine Tool Company, New York; and Heintz Manufacturing Company, Pennsylvania. During World War II, Mr. Kendall was a member of British Parliament, and a member of the British War Cabinet Production Board, and also served as a consultant to the United States Army, Small Arms Division.

Mr. F. Thaheld is Vice-President, Engineering. Mr. Thaheld has long been considered an authority on diesel engine designs. He has designed and successfully flown the first C.A.A. approved dieselized aircraft. During World War II, he developed and directed the manufacture of the Guiberson air-cooled radial diesel engines used in the U. S. Army tanks. Since 1945, he has been seeking further improvements in diesel engine combustion, particularly in small lightweight diesel engines. He is responsible for the reduction of the high firing pressures in his combustion principle which is called controlled combustion and is capable of using all types of fuels. His combustion features will be incorporated in the Hallett diesel line.

Russell G. Livingston is Works Manager. Mr. Livingston has had over 14 years' experience with Hallett Manufacturing Company, many years with the Hallett Engineering Department as Assistant to the Chief Engineer, and Manager of the Engineering Department. He transferred to sales, and became Assistant Sales Manager, then Sales Manager. He transferred to the new company as Works Manager.

American M. A. R. C. is embarking on a program to produce their diesel engine line in large quantities to insure high quality and prices that will be competitive with engines of foreign manufacture. They are building a large new facility which will be tooled with full and semi-automatic machines capable of a high production rate. American M. A. R. C. is engaged in several development programs, one of the most interesting being lightweight portable generating plants for the United States Marine Corps. In this instance, American M. A. R. C. is supplying only the engines, and O'Keefe & Merritt of Los Angeles is manufacturing the generator. There are four basic models with the following military nomenclature:

PU-345/G – 4 kw 400 cycle 120/208 volt, convertible to 2.5 kw, 120 volt, 1 phase.

PU-346/G – 3.5 kw 60 cycle, 120/208 volt, convertible to 2.5 kw, 60 cycle, 120 volt, 1 phase.

PU-347/G – 8 kw, 400 cycle, 120/208 volt, 3 phase, convertible to 5 kw, 120 volt, 1 phase.

PU-348/G – 7 kw, 60 cycle, 120/208 volt, 3 phase, convertible to 5 kw, 120 volt, 1 phase.

The above machines utilize the Hallett model AC1 6.5 hp 1 cylinder air-cooled diesel engines for the 3.5 and 4 kw units, and the Hallett model AC2 14 hp 2 cylinder air-cooled diesel engines for the 7 and 8 kw units. All generators are O'Keefe & Merritt self-excited permanent magnet type. The unit illustrated is the PU-345/G, 4 kw 400 cycle with the following general specifications:

Type: A.C.–400 cycles, 4 kw, 120/208 v. 3 phase self-excited (permanent magnet).

Manufacturer: O'Keefe & Merritt Co., Los Angeles, California.

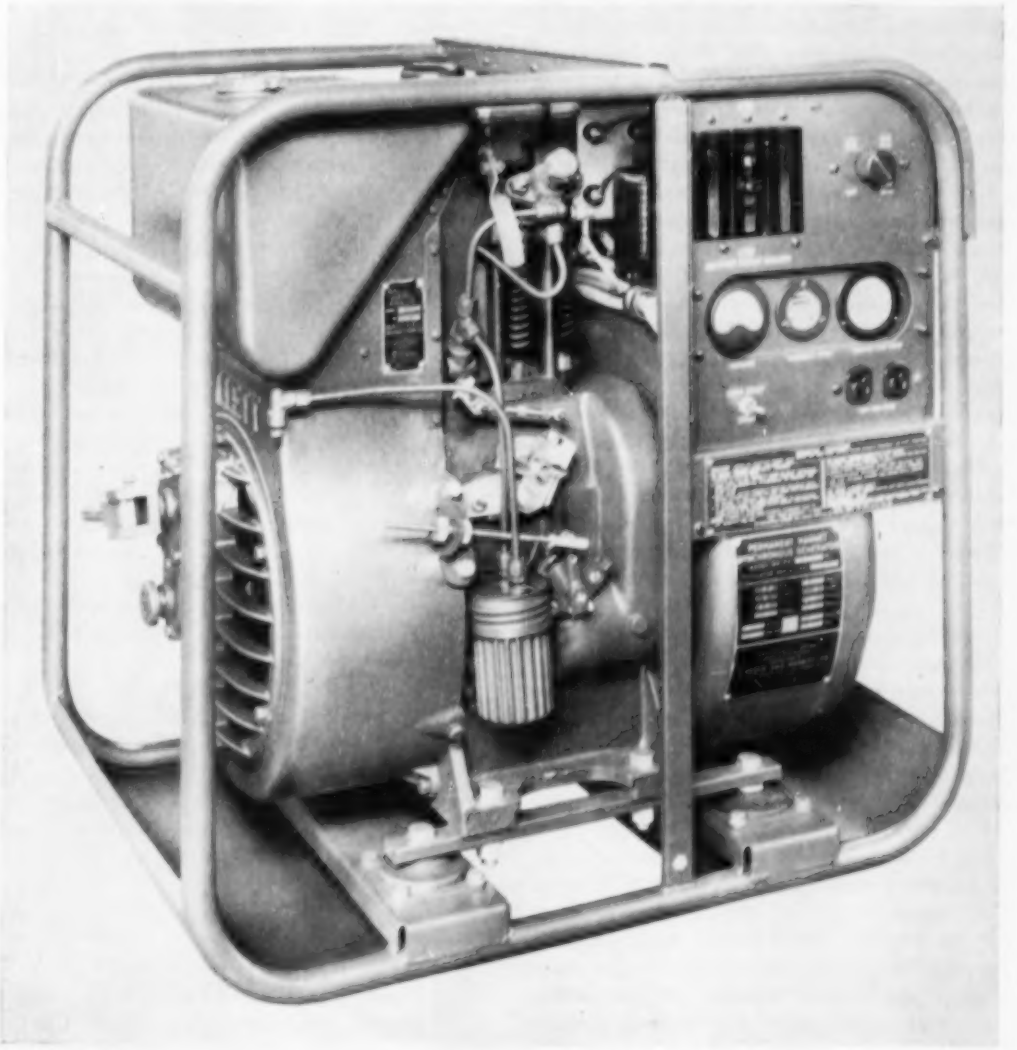
Prime Mover data: Hallett model AC1 6.5 hp single cylinder air-cooled full diesel.

Special features: 1. 4000 hour service life.
2. Unit weight 300 lbs.
3. Permanent magnet no bearing rotating field.
4. Wye-Delta change board.

Covering Specification: MIL-G-18349 (MC)

These units will successfully meet or better every requirement as specified under MIL-P-11122 (SIG-C), and they meet all requirements of specification MIL-G-18349 (MC). It is interesting to note that while being driven by 1 and 2 cylinder diesel engines, the units still meet the speed (frequency) requirements of specification MIL-P-11122 for 4 cylinder gasoline driven units. The 7 and 8 kw units are available with an isochronous governor which provides frequency regulation of less than 1% no load and full load, and voltage regulation 2% no load to full load. The isochronous governor with its droop control allows for parallel operation for large power demands. Their closeness of regulation, light weight, and compactness, fills a very important requirement for the highly specialized electronic equipment currently being designed and used by the various military agencies.

This is the 4 kw, 400 cycle self-excited O'Keefe & Merritt generator. Set is powered with a Hallett 6.5 hp single cylinder air-cooled diesel. This unit weighs only 300 lbs.



RAILROADS ARE USING RESIDUAL FUELS

By JAMES JOSEPH

RECENTLY as a Southern Pacific EMD F-7 freight locomotive worked upgrade, over the Sierra Nevada, bound Roseville, Calif. to Sparks, Nevada, its diesel engines alternately burned distillate and blended residual fuel oil. The locomotive started up on distillate. As it reached high output and heavy load, a newly-installed switching mechanism shut off the diesel's distillate line to the engine and opened the residual. The engineer wasn't even aware of the change, for the switch-over was completely automatic. Nor could an observer have detected the change-over; exhaust stack smoke was the same.

But dual-fueling, particularly for freight locomotives, is most assuredly being observed by the nation's railroads. In it they see more miles per gallon, reduction in fuel-bills, better high-speed-high-load performance, and most importantly, a new, broader fuel pattern, which means a greater range of fuels for diesel locomotives. Southern Pacific has already converted 28 of its freight locomotive units to dual-fuel consumption. Great Northern, New York Central and the Milwaukee Road are likewise running dual-fuel tests.

The impetus behind these tests is the conviction that railroading's entire fuel pattern should and can be broadened; that fuel costs can be pared while simultaneously releasing huge quantities of distillate for eventual cracking into gasoline and jet fuel (U.S. railroads now take fully 50 per cent of all diesel oil, in 1955 burned some 2½ billion gallons). In time of national emergency, a broader-based fuel pattern would loom important—both for the men on the tracks and for those in the air. Oil companies, too, expect to profit even tho railroaders will be paying less for their fuel. Why? Because residual consumption will release distillates for jet-plane use. And the jet fuel price tag is even higher than diesel rail fuel. Three companies work closely in these tests: Southern Pacific, which has tested experimental diesel fuels; Union Oil Co., which pushed the idea thru research and development; Nemec Combustion Engineers (Whittier, Calif.), whose automatic fuel-switching device is heart of change-over system.

Involved is a governor-controlled valving system. One valve alternately feeds distillate or residual fuel to the injector manifold. Southern Pacific has compartmentized its fuel tanks, now carries 350 gallons of distillate in one compartment, 1150 gallons of residual in the other. The tank's insulated, an assist in keeping residual tank temperatures at about 110-120 degrees F (warmed by engine jacket water). Automatic switching occurs between the locomotive's fourth and fifth throttle positions. The locomotive (so far, all freight engines) starts up on distillate. As it reaches the 5th throttle position, the valves reverse, and the engine is fed residual. In schematic, residual flows from storage tank thru a suction strainer to the gear pump, to a heat exchanger containing the heated primary filter and final filters, thence to injectors. Residual returns from the engine header to its storage tank on the suction side of the residual fuel strainer, aiding here in pre-heating incoming fuel. Regular distillate flows from the smaller storage tank thru a suction strainer to the gear pump, to the string-wound filters, then thru sintered metal filters to the injectors, returning to the suction side of the fuel pump, or recirculating through header line, as desired. Time-delay relays prevent distillate-to-residual switch while the engine's working the yards. A time-delay on the return selector valve guards against contamination of distillate and residual when throttle positions are reduced. The systems are air operated and electrically actuated.

Rather than operate full time on 10.5 cents per gallon distillate, or a 50-50 economy blend (costing perhaps 9 cents a gallon), a railroad's locomotives run probably 85 per cent of the time on light residuals priced at about 7.5 cents a gal. The non-additive residual used has an A.P.I. gravity range of 13 to 18 degrees, a sulphur content of 2.5 to 3.5 per cent, and cetane number in the 25 range.

Engineering the change-over wasn't easy, but the results so far are very encouraging. "Not all the problems have been licked," emphasizes Union Oil's John Broughton, manager Railroad Sales and Engineering. The heavier, dirtier residual requires remedial measures, offsetting the seemingly unavoidable higher maintenance costs. For one thing, the residual must be heated. Hot water for heat exchanger units comes directly from the jacket water supply of the engine. Temperature data show that with about 16 sq ft of heat exchanger surface and with a fuel pump capacity of 240 gph, residual in the locomotive tank is held to satisfactory temperatures. With adequate heat exchanger surface, oil to the primary and finish fuel filters can be preheated, maintained at nearly the engine's coolant temperature (residual is injected at 160-165 degrees F). Engine jacket water supplies two circulating systems: one pre-heats fuel prior to injection; the other keeps a stream of hot oil flowing to the fuel storage tank. Thus the heavy oil is hot enough to move freely thru feeder lines, to burn with maximum efficiency in the diesel's combustion chambers.

The Nemec control unit itself incorporates the pre-heating unit. Conversion costs per locomotive, including tank compartmentizing, is running in the neighborhood of $3500, the outlay repaid in approximately one year's operation thru lower fuel costs. Theoretically, at least, the higher Btu content of 17-degree gravity residual (148,000 Btu per gallon) should increase per gallon mileage by about 3.5 per cent. One systems developer claims the increase is closer to 6 per cent, this, when compared to a standard distillate (with 143,000 Btu, gravity of 36-degrees).



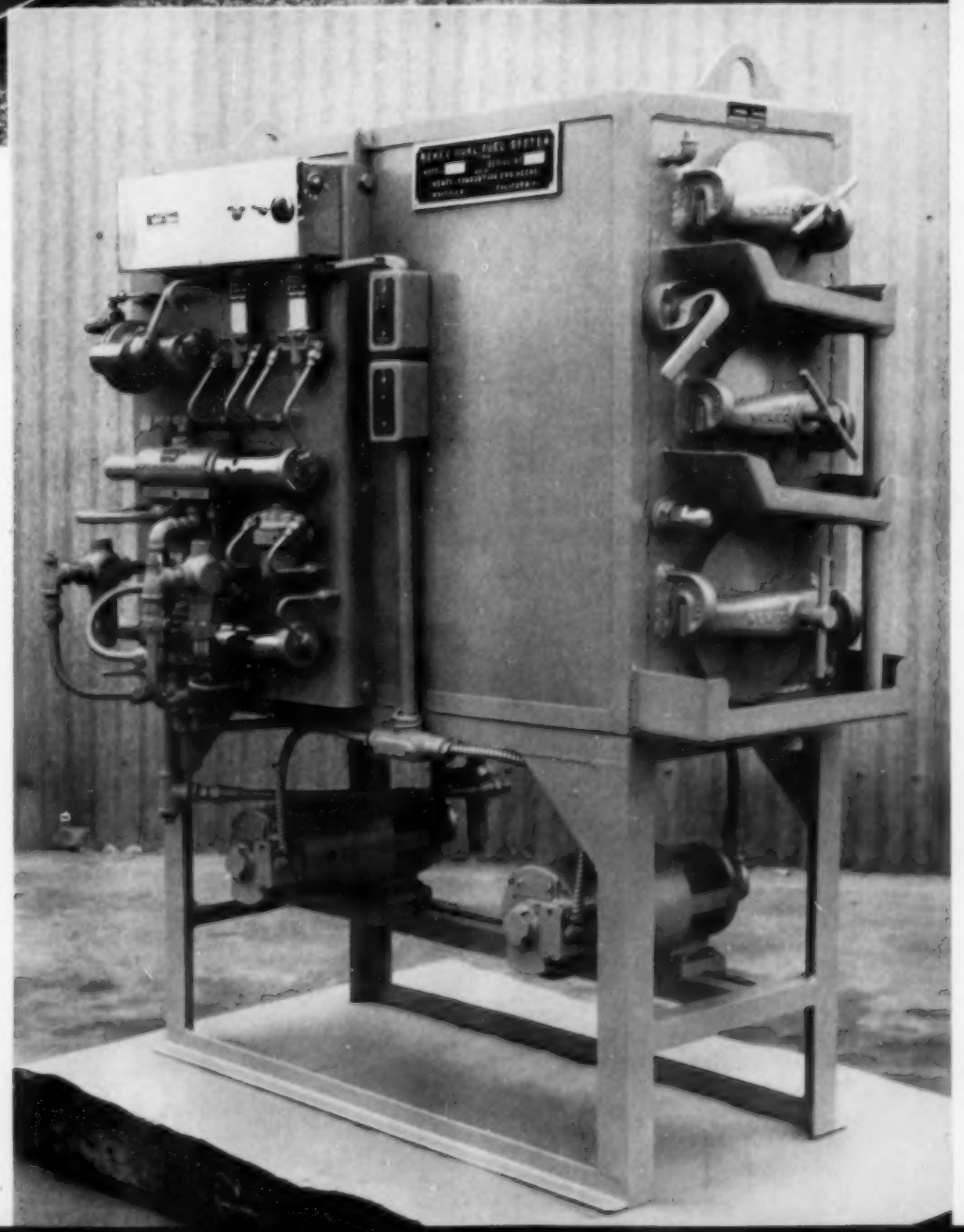
Southern Pacific 3-unit freight locomotive equipped with the dual-fuel system working well with a heavy load of freight. Southern Pacific has been encouraged with locomotive performance in these dual-fueling tests.

Heart of the dual-fuel railroad system used on the Southern Pacific Railroad is this Nemec Dual Fuel monitor unit which automatically switches fuel from distillate to residual and back to distillate again as locomotive engine operation requires.

Engineers have been experimenting with various devices, all aimed at aiding engines to digest the heavier fuels. Among them: (1) use of a blend of residual and distillate. (2) use of purifiers and filters to remove water and other residual contaminants. (3) pre-heating oil before it goes to injectors. (4) development of better crankcase oil to control contaminants and more frequent lube oil changes. (5) increasing jacket water temperature. Some, or all of these methods, are incorporated in the Nemec system. And Union, for its part, is currently investigating a new concept in lubricating oils for use with the residual fuel.

Experience to date has not reflected any undue maintenance difficulties and neither Union nor Southern Pacific believe that residual's low-cost advantages will be eaten up by any maintenance problems that may eventually arise. As for more frequent lube oil changes? Lube oil costs run only 2 to 3 per cent of operating costs, while fuel amounts to approximately 50 per cent. It was in mid-1953 that Southern Pacific began serious study





of experimental diesel fuels. A variety of blends or all-cracked fuels were tried, with general specs of: Viscosity (ssu at 100-degrees F), 33 to 50 sec; minimum cetane number, 34; maximum sulfur, 1 per cent; pour point, 25-degrees F. in summer and minus 5-degrees in winter

Not satisfied, Southern Pacific turned to residual blends, encouraged by the price differential over straight-run distillates. It might be noted that one railroad claims to have saved $500,000 over a year's operation when fuel costs were reduced a mere 1-cent per gallon. The tremendous savings with costs pared 2 to 3 cents a gallon are obvious. But Southern Pacific and Union Oil first had to decide on a residual. Selection was limited by the maximum viscosity reducible to optimum injector viscosity by heat-exchange, using available jacket water. And for Southern Pacific diesels, jacket water is held to 160-185 degrees F. Picked was a residual blend with a viscosity of 300 ssu at 100-degrees F. This fuel, when heated to 160-degrees F., has an injection viscosity of around 80 seconds. For testing, Southern Pacific standardized on the residual blend, a practical approach considering readily available jacket water temperatures. Union, reviewing results, says "residual fuels gave a surprisingly good performance under high-load conditions—the type of operation that accounts for approximately 85 per cent of a locomotive's fuel consumption on test runs. Residuals, were consumed at top efficiency by the diesel engine."

Some other findings were: (1) residuals created no more exhaust fumes than did distillates—this, in itself, a test for efficient combustion; (2) residuals added no insurmountable problems to engine performance or maintenance costs; (3) consumed under high-load, residuals worked more effectively by powering the locomotive farther per gallon than diesel fuel, thanks to residual's higher Btu content. Previously, researchers had shown that proper filtration and heating could reduce residual's most objectionable contaminants, which send maintenance costs climbing. One series of tests (not Southern Pacific's) proved the effectiveness of filters. A completely unfiltered fuel, consisting of #5 residual cut with 25 per cent No. 1 kerosene, was tried. After 1750 hours, power and oil control fell off drastically. Fuel injection pumps and valves were found badly worn, as were compression rings. In a second test, the same fuel was used but filtered (filtered with 8-12 micron paper). Result: after 1230 hours, inspection showed injector wear at satisfactory level, though top compression ring wear was still high. But cylinder liners were normal. More recent road tests seem to indicate that injector deposits reach equilibrium in a relatively short time, becoming no more severe over extended service. One explanation: alternate fueling keeps tips cleansed, and purges system of contaminants. Although other maintenance problems may arise, months of service to date reveal no unsolvable difficulties.

One thing's certain: should the switchover become accepted nationwide (and indications are that it will in time), railroaders will find themselves in a far better fuel situation come a national emergency. And, paradoxically, while drastically reducing their own staggering fuel bills, they'll be helping to put more jet fighters in the air.

VICTOR HANSON TRIES SOMETHING NEW

Victor Hanson, Manager Of Agra Lite REA Cooperative At Benson, Minnesota, Successfully Tries Out A Powdered Metallic Mixture Designed To Reduce Bearing Wear.

By REX W. WADMAN

BACK last April, in our April issue of 1955, we devoted a substantial amount of space to describing and illustrating the Agra Lite REA and the experiences through which this outstanding cooperative had gone in changing over from regular diesel fuel to residual fuel. In that article we told you, our readers, how successful Manager Victor Hanson had been in licking problem after problem and finally getting his plant running smoothly and very economically on residual fuel.

Before we go into details of another successful experimentation on the part of Mr. Hanson, we will outline briefly for you what we told you last April, 1955. Agra Lite has five 1,850 hp turbocharged Cooper-Bessemer diesels producing more than 18,000,000 kwh a year to supply the cooperative's 4,025 consumers over 2,300 miles of distribution line. Their plant at Benson is strategically located to supply its broad consumer area in Western Minnesota, but fuel costs are high up there, no natural gas is available, hence the reason for Manager Hanson changing over from 23-25 API gravity crude oil to residual fuel. Experimentation went on through 1953 but it was January of 1954 before residual oil became the regular diet for the five Cooper-Bessemer engines. Actual fuel saving in 1954 was $42,592.72 but the amortizing of the investment necessary to convert this plant over to use of residual fuel meant that in 1954 these charges amounted to $12,823.69 so that the actual saving in that year was $29,769.03 and we understand that the savings for 1955 were substantially above that figure.

So Victor Hanson, who has managed this fine REA plant since its inception is quite well known throughout these United States, especially amongst the REA Managers as a gentleman willing to take a chance, so when his attention was drawn to an article which appeared in the August 11, 1955 issue of "Iron Age" on a new metallic mixture which, when added to the lubricating oil reduced bearing wear, his was the type of mind that said, in effect "let's try it".

To better understand why Mr. Hanson became so interested we're going to quote just briefly some of the material which appeared in that article in "Iron Age." In the heading of the article was "New Powdered Material Reduces Bearing Wear". Then the subhead read "Can worn, Corroded machine tool bearing surfaces be reconditioned while the machines run? . . . Security Engineering Co. does

Plant records on Cooper-Bessemer Diesel taken week prior to processing with Iso-Mite, and for four consecutive weeks immediately following. Engine's rated horsepower: 1850; RPM: 327; Sump Capacity: 450 Gallons; Value: $155,000.00.

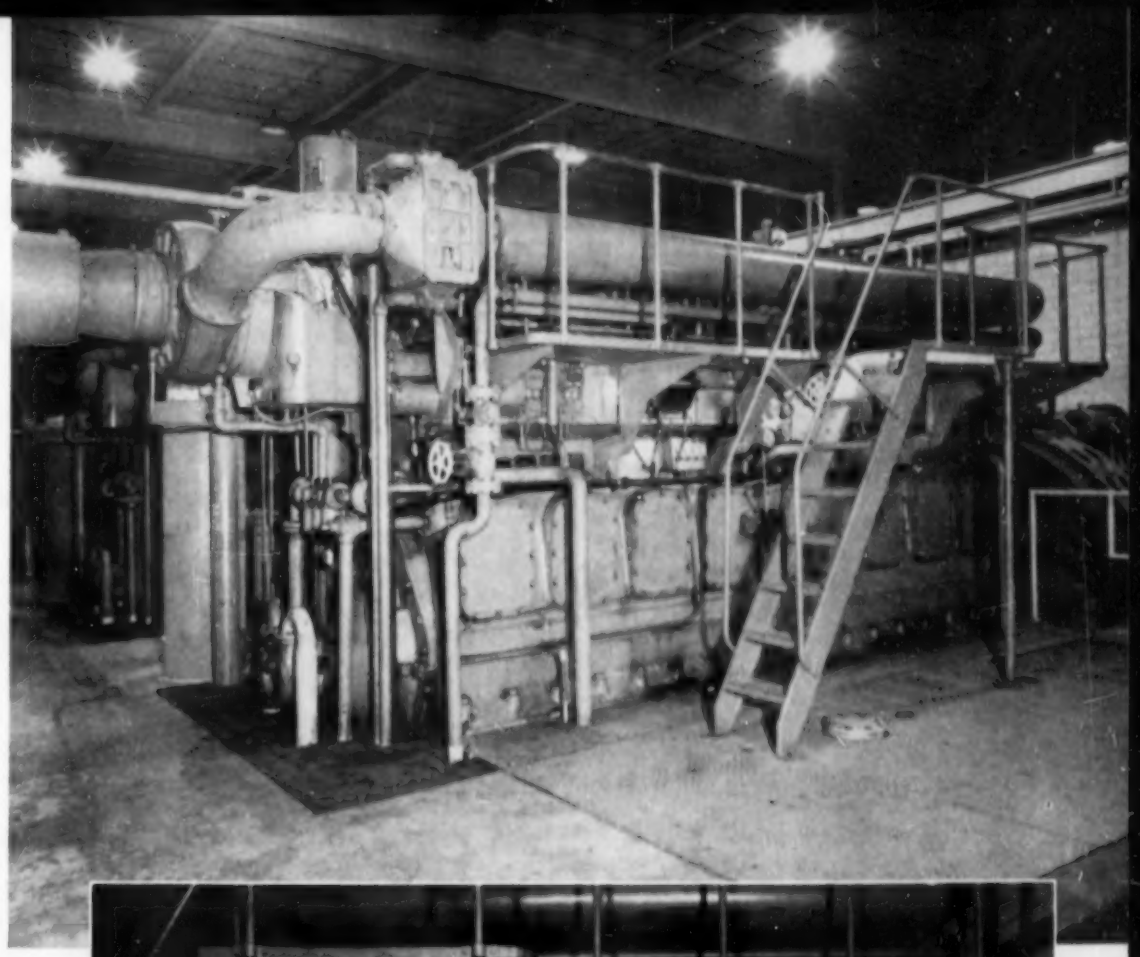
DATE	KILOWATTS GENERATED	GALLONS FUEL USED	AVERAGE KW PER GALLON
9/16/55	10,500	770	13.63
9/17/55	12,800	950	13.47
9/18/55	6,300	450	14.00
9/19/55	12,100	870	13.90
9/20/55	14,500	1,050	13.80
9/21/55	13,500	960	14.06
9/22/55	14,200	1,000	14.20
TOTALS:	83,900	6,050	13.86
9/23/55	17,900	1,250	14.32
9/24/55	19,100	1,320	14.46
9/25/55	18,900	1,260	15.00
9/26/55	19,000	1,350	14.07
9/27/55	19,000	1,320	14.39
9/28/55	18,500	1,260	14.68
9/29/55	17,900	1,250	14.32
TOTALS:	130,300	9,010	14.46
9/30/55	19,100	1,300	14.69
10/1/55	18,200	1,270	14.32
10/2/55	18,900	1,270	14.88
10/3/55	19,600	1,370	14.30
10/4/55	20,100	1,390	14.46
10/5/55	19,100	1,340	14.25
10/6/55	19,100	1,260	15.15
TOTALS:	134,100	9,200	14.57
10/7/55	19,400	1,410	13.75
10/8/55	19,000	1,140	16.66
10/9/55	18,000	1,230	14.87
10/10/55	19,000	1,280	14.84
10/11/55	18,700	1,310	14.27
10/12/55	17,300	1,310	14.91
10/13/55	18,900	1,460	12.94
TOTALS:	130,600	8,940	14.61
10/14/55	18,300	1,010	18.11
10/15/55	18,900	1,280	14.76
10/16/55	18,300	1,260	14.52
10/17/55	18,900	1,310	14.42
10/18/55	18,000	1,190	15.12
10/22/55	19,800	1,400	14.14
TOTALS:	112,200	7,450	15.17

it by adding micro-sized particles of a copper-lead mixture to the regular machine lubricant. The treatment is standard maintenance practice for all of the firm's machine tools, old and new . . . Other uses for the powdered metal mixture include coolant additions for longer tool life; also to reduce wear in hydraulic valves."

Mr. Stanley Hodge, Manager of Tooling & Maintenance Department for the Security Engineering Company at Whittier, California, wrote this article which appeared in "Iron Age" and all through it he refers specifically to the successful use of this powdered mixture to fill the metal pores and marred surfaces with a smooth coating.

Obviously Mr. Hanson had to scratch his head a little, ask quite a few questions, and then he decided that his investment in diesel engines was very heavy, the wear on these engines since he started to use heavy fuel, while not extreme, not even serious enough to bother him, still was a factor in his thinking and in the overall economy of his fine plant. So he thought to himself if this powdered metallic mixture will, in effect, put a new bearing surface or wearing surface on the inside of my engines without doing harm to anything, then it's worth a try—so he tried it, and here's the answer and we quote from a letter written by Victor Hanson, Manager of the Agra Lite Cooperative of Benson, Minnesota, to the Iso-Mite Corporation, Los Angeles, California, and that letter of his was written on June 28, 1956: "On September 23, 1955, we added Tech-O-Loid to the lubricating oil in one of five 1,850 hp diesel engines in our power plant. Engine No. 4 was used for experiment with this product. According to fuel records, before and after treating the engine, we noted a substantial increase in kwh production per gallon of fuel consumed by this particular engine. Notable, also, is the fact that the lubricating oil in the engine has remained remarkably clean up to this date, June 28, 1956, nine months after treatment. The engine, too, is unusually clean inside, including the pistons and rings. We have used your L7272 CG Series grease in the bearings of our water pumps, pump motors, exciters, centrifuges and air compressors. We have noted definite improvement in that the bearings of the exciters are running cooler, and the bearings in the fuel oil centrifuges are standing up better than they used to. We intend to treat all five engines and, as you know, have purchased enough Tech-O-Loid for that purpose."

Now you can see from this that Victor not only went all out in trying Iso-Mite in one of his engines, but he used it on water pumps, pump motors, exciters, centrifuges, air compressors, etc. Frankly, to us here at DIESEL PROGRESS, when we first heard of this situation, we viewed the reports through jaundiced eyes. You know, we get a lot of products that are brought to our attention with super-enthusiasm, quite a few of which blow up under keen investigation, but the more we investigated this situation at Benson, Minnesota, the more convinced were we that Victor had come up with another good one, so for your information we are reproducing a table supplied by Mr. Hanson showing exactly what happened to his engine No. 4 in his experimentation with Iso-Mite.





At the top, one of the five Cooper-Bessemer turbocharged diesels shows to excellent advantage and immediately behind it are the four other units of the same size and make as currently installed at the Agra Lite Cooperative, Benson, Minnesota. Underneath the engine room illustration is Mr. Victor Hanson, Manager of the plant (the gentleman wearing glasses and holding the Stetson hat) surrounded by his highly efficient crew.

We found on further investigation through other facets of our industry that Iso-Mite was being successfully used in trucks, in tractors, in automobiles, so we thought, and we still think, that you, our readers, are entitled to know what we have found out about Iso-Mite, about what Victor Hanson is doing up there at Benson so that you, yourselves, can carry on your own investigation, your own experiments, and find out whether Iso-Mite can help you. On its surface, the claims are fantastic, the results apparently unbelievable—the mere idea of dropping a handful of metal, even though it be powdered metal, into your lubricating oil just gives the average diesel man the shivers, but that's just what Victor Hanson did at Agra Lite. Nothing happened to his engine, but his fuel costs per kwh went down—what more can a guy ask?



WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **BERNARD W. LANSDOWNE**

Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C., Ltd., Southall, following which he served some five years with that company's sales engineering department. He entered technical journalism as assistant editor of "Gas & Oil Power" in 1950 and was appointed editor in 1952.

THE Brush Group, Ltd., who are among the largest producers of diesel engines in the world, have now released details of a new design of turbo pressure-charger which they have in production at the Brush Electrical Engineering Co.'s works at Loughborough. Development work on the design has been going on for the past five or six years, during which time various prototype units have been tested on different makes of engine produced within the Brush Group.

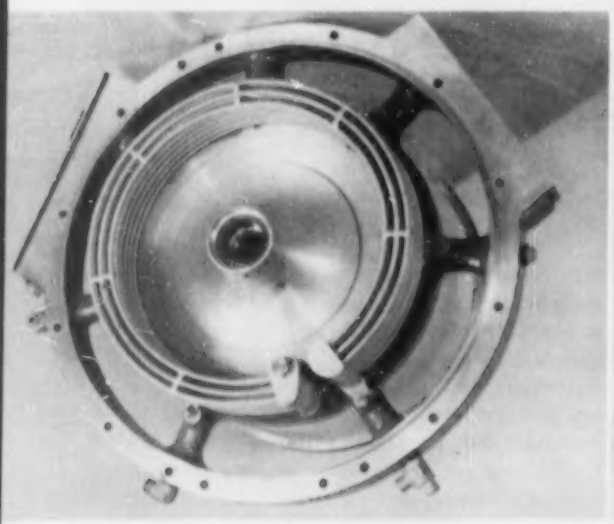
I was invited to Loughborough recently to see the new blower in production and to hear something of the development work that had gone into the design. The performance obtained from the turbo-charger was satisfactory from the onset and compared favourably with other makes, but considerable difficulty was encountered in achieving satisfactory mechanical operation. Heat soakage to the turbine bearing after shutdown was one of the major problems and this was eventually overcome by adopting a different method of location for the turbine disc on the rotor shaft. Lubrication was also a problem and a centrifugal type oil/air separator was found to be necessary to vent the lubrication system satisfactorily, enabling the unit to operate with negligible oil consumption. On the production side, a development of particular interest that may be mentioned is the welding of the austenitic turbine blades to the turbine disc. Experimental work was necessary to determine correct welding procedure, the best welding electrode and optimum form of weld groove.

The final design of the new Brush turbo-charger in its commercial form, incorporates a number of features which break new ground so far as contemporary European blowers are concerned. These include the use of plain bearings on hardened steel journals in place of the more usual ball and roller bearings. Air cooling for the turbine casing, moreover, is another feature for it tends to eliminate cooling water requirements and simplifies installation, particularly in rail traction applications. The blower incorporates its own in-built lubrication system with scavenge pump, a feature that enables it to run indefinitely at an angle of some 15 deg. in any direction and to function satisfactorily with momentary inclinations of up to 22½ deg. It is interesting to note that these figures coincide with those laid down by Lloyds for the lubrication systems on marine electrical generating equipment.

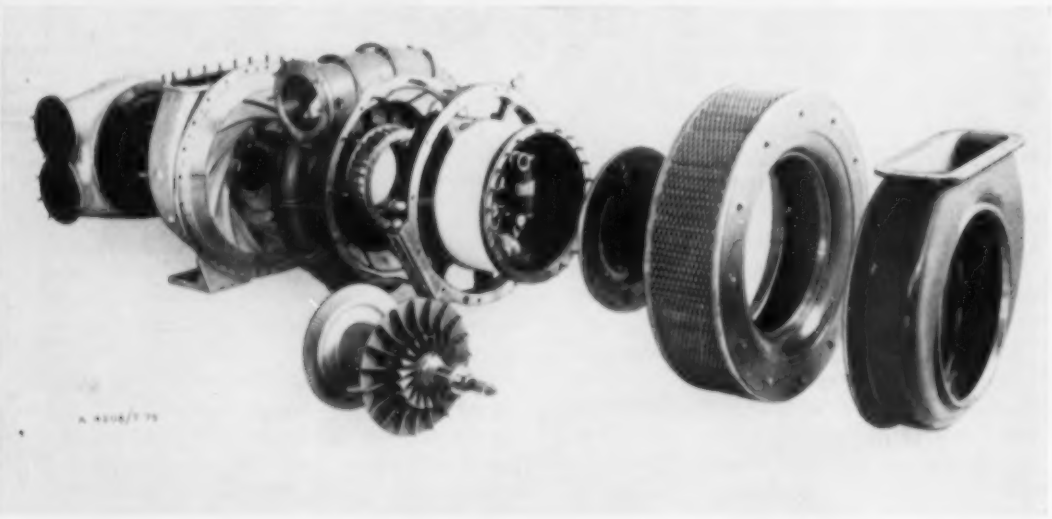
Dealing with the design in detail, the casings can be considered in two groups, namely the 'hot' casings of the turbine and the 'cold' casings of the compressor. The turbine inlet and outlet casings which are air cooled, are machined from heat resisting steel and, together, form the annular path through which the engine exhaust gases flow. The volute casing and rear cover comprise the compressor casings and are cast in a light alloy material. To allow for the differential expansion between the turbine exhaust casing and the volute rear cover, radial pins clamped by spring plate assemblies are employed to ensure concentricity and alignment during operation. A similar arrangement centres turbine bearing support casing in relation to the turbine inlet casing. By this means the rotor assembly is maintained in correct alignment in compressor and turbine casings when the latter expand at working temperature.

A nozzle ring is located in the turbine inlet casing

Rear view of air intake bearing mounting showing the oil cooler.



Exploded view of the Brush Electrical Engineering Company's turbocharger.



by the nozzle support ring and is free to expand radially. It consists of a set of stainless steel blades cast into concentric cast iron rings, the outer ring being divided segmentally to allow for differential expansion. Diffuser ring is clamped between the volute and rear cover, and the latter provides forward location for the mounting foot. An intake air prewhirl assembly is supported on the front face of the volute casing. A labyrinth ring is bolted to the volute casing rear cover and prevents leakage of air from the impeller tip to atmosphere along the rotor shaft and past the downstream face of the turbine disc. The labyrinth ring is positioned to reduce rotor end thrust to a minimum.

A light alloy casting forms the intake bearing mounting, which is spigoted to the volute casing, and within which are mounted an oil pump, drive shaft, oil filter complete with integral by-pass provision, relief valve, compressor bearing, thrust block and labyrinth bush. The oil tank is cast integrally and a light alloy cover encloses the front tank space. An annular oil cooler is mounted on the cast radial support arms which are drilled to provide passages for oil supply and return, and air supply and air return from the turbine bearing, thus reducing internal pipework to a minimum. The oil level sight glass can be fitted to the oil tank cover or on either side of the machine to suit installation requirements.

An air intake filter unit is bolted to the front face of the intake bearing mounting and comprises an annular three-ply oil wetted element housed in light alloy castings. The walls of the volute casing, the oil tank casing and the filter support plate are lined with sound-absorbing material. An inlet casing can be fitted as an alternative to the filter unit. Turning now to the rotor and bearing assembly, this consists of a steel shaft on to which are spigoted the centrifugal impeller and turbine disc. The shaft is supported at each end by plain bearings and axial movement is limited by a thrust bearing situated adjacent to the compressor bearing. The bearing journal surfaces are hardened and ground and labyrinths are pressed on to the shaft. The bearing shells and labyrinth bushes are a press fit in the respective housings and are retained by studs and nuts.

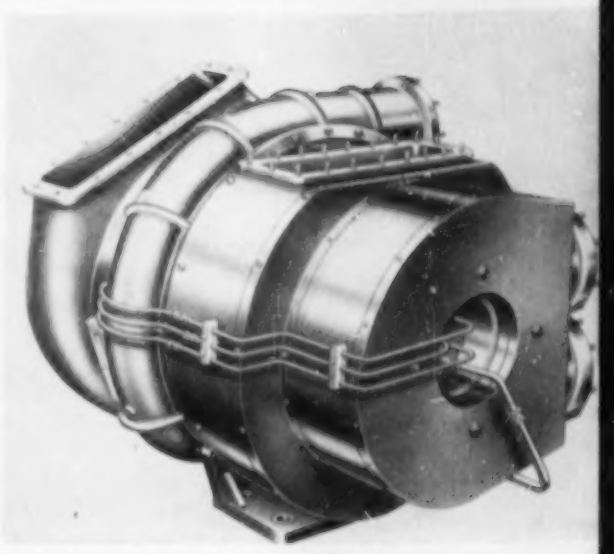
The centrifugal impeller has 19 vanes, is machined from a light alloy drop forging and has integrally formed rotating guide vanes. The impeller is pressed on to a shaft spigot and retained by a nut; the drive is transmitted primarily by the fit of the spigot, but a driving pin is provided. The turbine disc is machined from an austenitic steel forging with blades of the same material welded to the rim. The disc is retained on the shaft spigot by a central nut in such a manner that heat flow along the shaft to the bearing journal is minimised.

Gas leakage from the turbine to atmosphere along the rotor shaft is prevented by the labyrinth supplied with pressurised air from the volute casing through an external pipe and internal drillings. The air flows under a controlled leakage towards the turbine disc, cooling the upstream face of the disc before mixing with the gas stream. The pressurised air leaking into the turbine bearing housing is balanced against the air pressure in the compressor bearing housing by an external pipe.

Gas leakage to atmosphere between the turbine inlet casing and the bearing support casing is prevented by a piston ring seal. A worm, from which the drive to an oil pump is taken, is keyed to the compressor end of the shaft. The complete rotor assembly is balanced by removal of metal from raised rings on the face of the turbine disc, and the rotor shaft adjacent to the impellor. Provision is made for hand tachometer readings to be taken from the compressor end of the shaft.

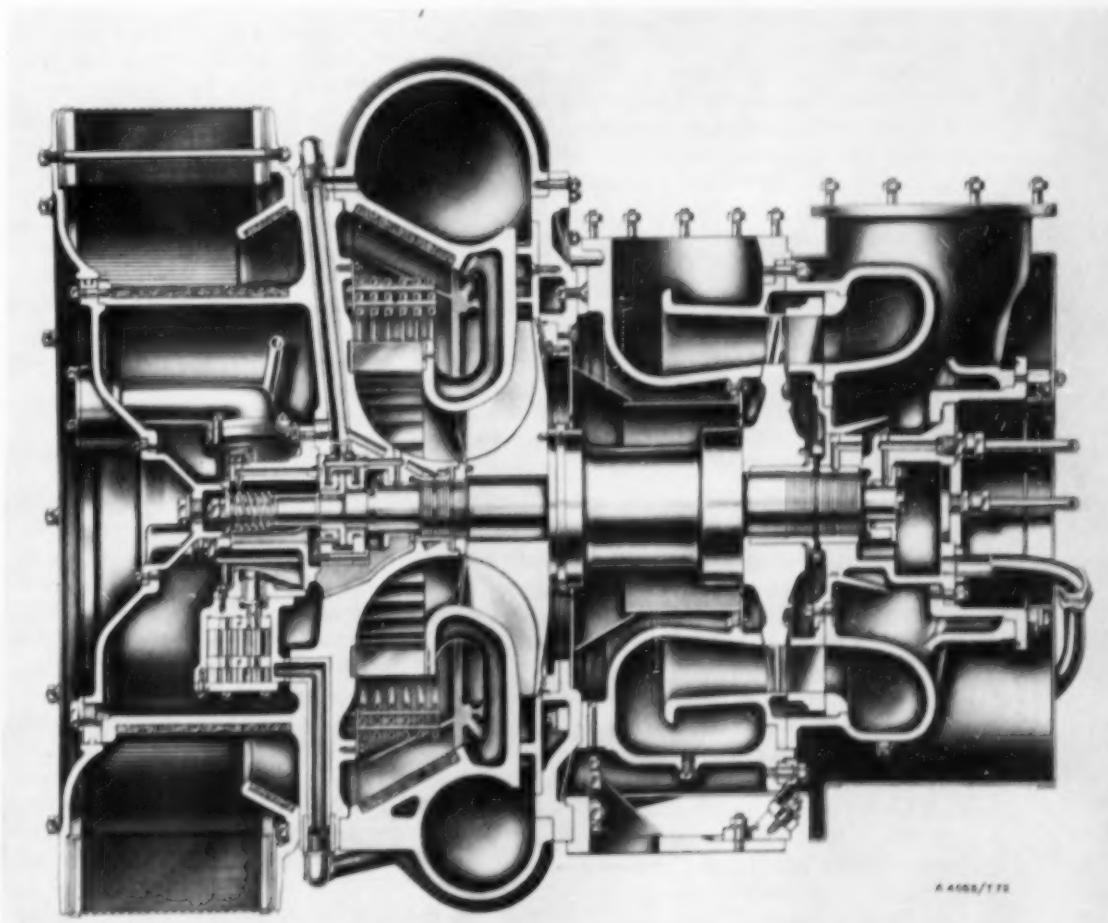
The self-contained lubrication system mentioned previously is of the pressure fed re-circulating type. A gear pump immersed in the oil tank and driven from the shaft by the worm and worm-wheel, circulates oil at pressure through a two-pass annular oil cooler and then through a full flow filter. A relief valve is provided for the pump and the filter is equipped with a by-pass arrangement which operates only if the filter is allowed to become too dirty and then permits unfiltered oil to be supplied to the bearings. Filtered oil is fed along internal passages to the compressor bearing and thrust block and, through an external pipe, to the turbine bearing. Oil draining from the compressor bearing is passed directly into the oil tank, whilst the oil drain from the thrust block is directed to the contact face of the worm drive before draining into the tank. Oil from turbine bearing drains into a sump in bearing housing from which it is returned to tank by the scavenge pump.

The air pressurised labyrinths at both compressor and turbine ends form a seal and prevent oil entering either the air or gas streams. The oil pump drive shaft incorporates a centrifugal oil separator which reduces the oil content of the air which is vented from the gearbox. Production of the new turbocharger at Loughborough is on a very modest scale at the moment, but plans are in hand to increase this as the demand rises but I understand that the selling price of the new unit will be competitive with other contemporary designs.



External view of the Brush Electrical Engineering Company's series 20 turbocharger.

Cross-section showing the sectional arrangement of the Brush series 30 turbocharger which is the largest of the two units presently under test.





EASTERN DIESEL OBSERVATIONS

A COMMENTARY BY **ARNOLD B. NEWELL**

Arnold B. Newell, a third generation American, was born near Seattle, Washington of pioneer stock. He obtained his engineer's license at 21. Sailed as chief engineer on one of the first ocean-going motorships built in the U.S.A. In 1924 he joined New York Shipbuilding Company in diesel advisory capacity, tested and took to sea New York-Werkspoor diesels, supervised operation of shipyard owned vessels, then in 1927 joined Ingersoll-Rand as diesel field engineer. Became associated with "Motorship" in 1929. Subsequently became managing editor of "Motorship" and "Diesel Power," then vice-president and general manager.

The Exhaust Gas Pyrometer

Of the many accessories employed in connection with diesel operation the pyrometer for reading exhaust gas temperatures has proved to be one of the most useful and universally employed instruments. It seems that almost every operator knows how to use it in analyzing engine performance. In recent years we have not heard much about the way to use it. Nor has there been any public controversy over its value by comparison to the engine indicator.

In this field we also have several versions of the cathode ray oscillagraph which is known by some other names such as pressure graph and oscillascope. No matter what they are called these devices are electronically operated indicators performing a service somewhat similar to that of the mechanical pressure indicator. The pyrometer is not so positive in action. Temperature of the exhaust is related to the condition of combustion but it is not a direct reading of anything in the engine cylinder. Low temperature means low load, too little fuel or unbalance of the load. High temperature may mean too much fuel, too late injection, overload, a bad exhaust valve, etc. Variation of temperature between cylinders means unbalanced load. All of these readings have meanings for the experienced operator and strange as it may seem, about as much dependence is placed in the exhaust gas pyrometer as an instrument for checking operating conditions as we place in pressure gages to show the pressure in a tank or a pipe.

Diesels in Central Plants

Not too long ago a hue and cry went up amongst the manufacturers of large stationary diesels that the market had gone to hell and big electric power demands would not again be met with diesel engines. However, it is as true now as it has been all down through the years of diesel engine market development that the pendulum swings both ways. Generally speaking a poor field today will become rich tomorrow. For quite a long time New England was pretty well written off as a washed out diesel market. Today it is one of the best areas in the country for the sale of diesels and equipment of different kinds powered by diesels.

In some instances the engine companies are saying nothing about the orders they are booking. Others are frankly elated. Still others say the whole thing is exaggerated like the neck of the giraffe, but we know the diesel boom in New England is just as real as the same long neck. In some instances the units recently installed are large and powerful as for example the 5100 bhp Nordberg at Hudson, Mass. and the 1920 hp Fairbanks Morse just put into operation at the South Boston plant of the Gillette Safety Razor Co. In other instances the unit power demands are not very great but they total up to a substantial amount as in the case of Hartford, Conn. about to start revamping its system of water pumping with the installation of eight 500 bhp Caterpillars. After all this totals up to 4000 hp.

The call for equipment for highway construction in New England is an old, well known story. Perhaps less known is the fact that the yankees Down East are using diesels to take their baby chicks and fresh eggs to market, haul fertilizer and potatoes and high ball it down the roads at night with milk in tank trailers. Looks as if the diesel is helping the economy of the Rock Bound Coast in more ways than one. It also generates cheap power in the summer resorts. This prompts me to repeat what I have said before: "If you can find what appears to be a dormant market for diesels today start working it because sure as shooting it will be THE market tomorrow."

Self Propelled Offshore Drilling Tenders

The offshore oil drilling industry is too new to have found and built all the more useful things that will be employed as time goes on. The fact that drilling is done offshore and some of the equipment is anchored to the bottom while much of it is afloat has at times taxed the ability of the best engineering minds. In a few years we'll look back at the equipment now being used and get a good laugh out of the house-that-Jack-built approach to the whole matter. The work is a combination of oil production, structural engineering, naval architecture and diesel engine utilization, water and air borne personnel movement and development of areas hitherto inaccessible.

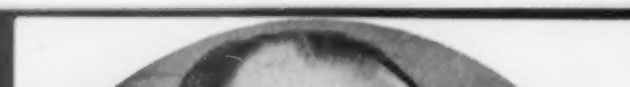
In this field one of the most interesting recent announcements came from New York Shipbuilding Corp. of Camden, N. J. regarding packaged production of specialized ships fully equipped for drilling operations in the Gulf of Mexico. The initial contract exceeds $3,500,000 for a diesel driven 2500 gross ton drilling tender and a 297 ton cargo supply motor ship to be built for Coastal Marine Drilling & Construction Corp. of Houston, Texas. Being something of an alumnus of the New York Ship school of shipbuilding, I still have a sentimental attachment to the place.

In view of the fact that it is quite a distance from the Delaware River to the Gulf of Mexico, it was hardly anticipated that this great shipyard would enter the field of offshore drilling equipment construction. Tenders in this service are anchored at the place of building a permanent steel drilling platform. The tender normally carries a matter of 3500 diesel hp without being self propelled. New York Ship will build this 2500 ton vessel as a self propelled unit, utilizing for propulsion power the diesel-electric installation also needed on non-propelled barges in this same service. The advantages of self propulsion include ability to move from job to job under its own power thus saving towing charges and freedom to move for self preservation in the face of an on-coming hurricane. No doubt the greater cost of building to comply with regulations governing vessels of self propelled type and the need to carry navigators is more than compensated for in the feature of mobility and safety. The smaller supply boat is pretty much of conventional design for this class of service.

Gasoline Motors and Pump Injection

The price differential between diesel and the gasoline motors has often been charged in large measure to the high cost of the fuel injection equipment. That the accusation has not been justified by the facts has been pointed out in these columns. Currently the American Bosch Corporation of Springfield, Mass. is conducting tests around town with several different stock models of automobiles equipped with their gasoline pump injection system.

It is pointed out that exact metering gives precise control of the amount of fuel delivered to each cylinder and the delivery of that fuel right at the inlet valve results in numerous operating advantages



such as faster pickup, smoother idling, better fuel economy and a cleaner running motor. However, it is not expected that pump injection will replace the carburetor on pleasure vehicles for some time to come, if ever. Installation is relatively expensive. It is pointed out that better engine performance and improvement in fuel economy are likely to result in pump injection being used on gasoline trucks and other commercial vehicles, on and off the highways. In this way, it is thought the diesel may lose some of its advantages.

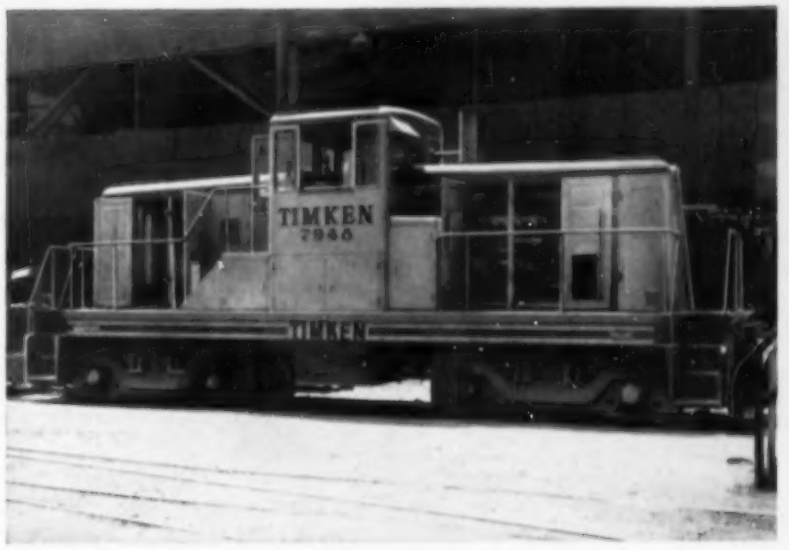
It would be an interesting switch if the item of equipment so frequently charged with responsibility for the higher price of the diesel later becomes the thing that will make the gasoline motor more competitive in the matter of over all operating expense. The gasoline fuel injection pumps made by American Bosch and by the German Robert Bosch companies are not of the same design. In both instances they are far less expensive than diesel fuel injection equipment for they deliver the metered fuel into the air at no pressure as it enters the cylinder, mingles conventionally, is compressed as a mixture and fired with electric spark. These developments are worth following here and abroad. Unfortunately for the gasoline engine maker they can not correct troublesome elements of gasoline. One is the danger of fire and explosion in confined spaces and the other is the annoyance from pilferage which can be an item of considerable magnitude in big fleets.

Burning Crankcase Drainage

The drainage from automobile crankcase is being used as fuel for the big diesel engines in the towns of Hudson and Ipswich, Mass. Perhaps it is being used in other plants as well. The process of preparing it for use as fuel is similar to the methods used in preparing residual fuels for the same purpose. The first impression might be that here is a source of supply of inexpensive fuel that is as reliable as the expanding use of automotive equipment, but it is not quite that simple. There is no problem in the ability of diesels to burn the lubricating oil which has many qualities superior to residuals. For example the crankcase drainage once processed remains fairly stable while residuals tend to cluster and perform numerous equally annoying tricks. There is ho sulphur in crankcase oil. It works well in conventional fuel injection equipment. There is one problem associated with its use and that is careless handling of a product commonly looked upon as slop. The high percentage of solids found in it demands the use of the more expensive self cleaning types of centrifugal purifiers. The cost of collection is another consideration and the effect of its extensive use in the face of an obviously limited supply may create a shortage. This in turn may create a higher price based upon the law of supply and demand.

There are many operators not too well versed in the fundamentals of the workings of the diesel. They may believe that something short of complete combustion when burning lubricating oil would not be harmful, but this is untrue. Poor combustion will have the same ill effect no matter what is burned. On the other hand there is not the danger of crankcase dilution that is commonly associated with misfiring.

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24,242 hours of service in 39 months

Since March, 1953, two Hercules 6-cylinder TCD's have been providing dependable and economical power for this 80 Ton G. E. Diesel-Electric Yard Locomotive #7948. Operating in the melt shop of The Steel and Tube Division, The Timken Roller Bearing Company, these two Hercules TCD's are establishing new records for continuous trouble-free service.

According to log sheets kept by the Timken Company's locomotive shop foreman, this equipment has operated 24,242 hours since it was put in service. Moreover, these hours have been logged under adverse conditions of extreme dust and heat, 24 hours a day, seven days a week for an average of 621 hours a month. Because of this record of performance this locomotive has been nicknamed "Old Reliable" by the men in yard. "Old Reliable" has been serviced under the Timken Company's preventive maintenance program. The TCD's were overhauled at approximately 14,000 hours and will have almost that many hours before the next overhaul.

Other applications of Hercules TCD's such as busses, generator sets, mine cars, marine applications, etc., have established similar record of power and performance. Yes, Turbo-charging is not new at Hercules. TCD is just a new name for a tried and proven product.

*Turbo-Charged Diesel

HERCULES MOTORS CORPORATION

CANTON, OHIO



AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Toward More Uniform Temperature

CLOSER constancy and uniformity of temperature throughout the engine is an ideal toward which designers of internal combustion engines have constantly striven and important accomplishments have been achieved. Because maintenance of temperature is even more vital in a diesel than in a carbureted engine, we find particular emphasis being accorded the matter by diesel designers. Uniformity and constancy are not one and the same thing, for by *uniformity* is meant the minimum difference in temperature between different parts of the engine, irrespective of what the general temperature may be. It refers, in short, to the distribution of temperature, while *constancy* refers to the ability to maintain a constant temperature, regardless of changes in ambient temperature or load upon the engine.

Without special effort to achieve a reasonable uniformity of temperature, there would be radical differences as between that of the cylinder head, for example, and the bottoms of the cylinders, since the source of heat is in the combustion chamber. In early designs the jackets were relatively short, the coolant being concentrated about the upper parts of the cylinders and heads, cooling being deliberately limited below that region to avoid over-cooling there. Such provisions were found unsatisfactory, however, since the uncooled portions tended to collect heat and consequently to undergo a steadily rising temperature. Furthermore, the absence of cooling at the bottoms of the cylinders tended to permit the crankcase temperatures to become excessive. Part of the time the upper ends of the bores were expanded to greater diameter than the lower ends and part of the time the reverse was true, making proper functioning of the pistons and rings difficult. Consequently, today, all modern automotive diesels have jackets extending the full length of the cylinders.

Early designs introduced the coolant at the lowest point in the jacketing, withdrawing it at the highest. Thus, the coolest water entered at the coolest portions and the hottest regions received the warmest. This naturally tended to intensify the difference in temperature between the two locations. Modern practice is to feed the coolant from the pump into the upper portions of the block and to direct it by carefully-proportioned ports or nozzles so that it first reaches such critical items as the nozzles and exhaust valves, circulation about the barrels being secondary. In this way the greatest cooling effect is secured where temperatures tend to be highest; the least where there is least heat to be carried away.

It is thus a far cry from the thermo-syphon system, so often used in early engines, which tended to produce extreme differences between the tops and bottoms of the jackets, to present arrangements. Not only is the direction of flow quite different, but the distribution is carefully controlled, so that each cylinder and head has the same rate of cooling. This is done by precise metering of the inlet ports or nozzles as well as the outlet distribution, in addition to which internal baffles are also employed in some designs to insure correct distribution. Owing to the greater complication of coring in the diesel cylinder head, it has been necessary to take extraordinary precautions to guard against regions of stagnancy or steam pockets. Energetic scrubbing action is achieved by increased velocity, which in itself makes it easier to control the direction of flow.

Benefits arising from greater uniformity of temperature thus attained are chiefly the ability to maintain higher mean temperature throughout the engine. This is because in avoiding excess temperature at the critical points, where uniformity is lacking, it becomes necessary to allow radically lower temperatures elsewhere, so that the mean temperature is lower than it should be. With greater uniformity, on the other hand, the mean temperature may be higher without exceeding a safe maximum at any point. Higher velocity of flow, in itself, does not materially affect the overall effectiveness of cooling, since it is the heat-transfer capacity of the radiator which ultimately determines the cooling rate. Neither does it imply any material increase in the gallons per minute circulated. The same volume of flow, through smaller passages, results in higher velocity with slight increase in power absorbed by the pump.

An important benefit from greater uniformity of temperature throughout the engine is in its effect upon lube oil temperature. As between the evils of cold sludging on the one hand and hot sludging, varnish and oxidation, from excess temperature, on the other, there is a range of temperature at which the oil can do its best work with a minimum of deterioration. To this end, various means are employed. Long water jackets—particularly where there is no protrusion of the sleeves or liners below the upper crankcase deck—provide a surprising amount of heat exchange between the oil and the coolant through conduction incident to splash of oil on the lower surfaces of the deck. Integral cylinder and crankcase construction also provides a certain amount of conductive heat-exchange through the iron and in some engines separate heat-exchangers are provided to maintain the lube oil temperature.

To the modern engine designer, the term Cooling System is no longer completely descriptive. Rather it is conceived as a temperature-maintenance system, having a warming mission as well and almost as important as cooling. From a cold start, it is important that all portions of the working parts of the engine come up to operating temperature as rapidly as possible. This is particularly true of the crankcase oil. This brings us to the matter of temperature constancy. As we have seen, greater uniformity of temperature, because it narrows the margin between maximum and minimum temperatures in different parts of the engine, permits higher mean temperatures without raising the maximum beyond a conservative limit. Likewise, the less variation in the mean temperature, the higher it may be without exceeding the maximum. It might be ideal to maintain a temperature of, say, 200 degrees Fahrenheit at sea level at all

times; but with a variation with conditions of 40 degrees, it would be necessary to design for 180 degrees. If the variation could be reduced to 20 degrees, then 190 would be the design temperature; if 10, then it could be 195.

Toward closer constancy of temperature, engine designers have made important advances. Fundamentally, it is essential that the cooling system have capacity to maintain the temperature well within the maximum under the most adverse conditions, such as 100-degree ambient temperature, 5,000 feet of altitude, no headwind and the engine operating at 100 per cent load. Obviously, uncontrolled, such a cooling system would produce temperatures in minimal circumstances far below what is desirable. Consequently means are employed to decrease the effectiveness of the system in proportion to the degree to which conditions are favorable to lower heat rejection by the engine. Commonest of these, of course, is the thermostatic valve at the outlet connection from the engine. The simple blocker type is hardly suited to the demands of heavy-duty automotive diesels and has largely been supplanted by the by-pass form. In this, the valve controls two ports, one of which permits the coolant to pass directly from the block to the top of the radiator, the other directing it through a by-pass, back to the inlet side of the pump. The thermostatic element controls the valve so that when a predetermined maximum temperature is reached, the by-pass port is closed and the one leading to the radiator is opened, thus providing full circulation for full cooling. Below a set minimum temperature, this port is closed and the by-pass port opened, thus recirculating the coolant actively through the jackets. This arrangement serves to prevent over-cooling and at the same time favors uniformity of temperature throughout the engine, while permitting maximum cooling effect when needed.

Every such thermostat operates within a range from maximum to minimum, so that it does not hunt, but tends to cycle at a rate determined by conditions. Naturally the closer the control of temperature effected, the greater the frequency of cycling. Those with a broad range, conversely, permit greater fluctuation in temperature and cycle less frequently. The latter also have the undesirable characteristic of admitting a surge of relatively cool water from the radiator, each time they cycle from by-pass to normal circulation, thereby producing fluctuations in inlet coolant temperatures and subjecting the engine to heat stresses. Also, this sudden influx of cooler water frequently causes extra fluctuations of the valve.

In almost universal use in diesel vehicles, therefore, is another popular form of temperature control—the radiator shutter. When used alone the shutter merely controls the passage of air through the radiator. This control is usually thermostatic, so that upon attainment of the maximum temperature for which set, the shutter opens and remains open until the set minimum is reached, and then closes. Like thermostatic valves, radiator shutters of this kind cycle; but at a much reduced frequency. They are incapable of as close maintenance of temperature as the thermostatic valve, respond more slowly and provide a slower warm-up. On the other hand they have the advantage of avoiding sudden surges of cold water.

Among the advantages of radiator shutter control is its ability to retain heat in the radiator during stops of moderate duration, so that restarting is facilitated and the thermal shock of circulation of chilled coolant is reduced and the danger of freezing is also reduced. Because the whole body of water is affected, this method of control is somewhat more favorable to the hot-water heating of the cab or bus body. Modern radiator shutters are usually power operated, either by air or vacuum, the latter, of course, in connection with gasoline engines only. Their blades are provided with packing, similar to weather-stripping, so that they provide a closer seal against the passage of air when closed. The thermostatic valves by which the thermostat controls are effective are usually located similarly to thermostatic water valves. For safety in emergencies they are usually arranged so that they are held open by a spring and closed by the application of air power. This, of course, means they are unable to remain closed during long protracted stops, since the air pressure will gradually diminish, allowing the blades to open. Reflection must lead to the conclusion that none of the means at present available for maintenance of constant temperature is a complete answer to the problem. As engines become more highly developed as to specific output and economy, they are bound to become more sensitive to temperature. For this reason a majority of producers of diesel vehicles employ both thermostatic coolant valves and automatic radiator shutters.

Detroit Diesel General Manager

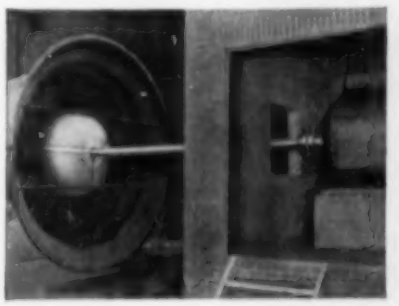


Clyde W. Truxell

Clyde W. Truxell, former works manager of the Detroit Diesel Engine Division of General Motors, has been appointed general manager of the Division. He succeeds Semon E. Knudsen who is now general manager of GM's Pontiac Motor Division. Mr. Truxell's first association with the GM Diesel engine was in 1932. At that time he was appointed a member of General Motors research staff and had much to do with the development of the GM two-cycle diesel first exhibited at the Chicago World's Fair in 1933. His efforts were later directed to the development of the more compact diesel package which today is used in many different applications in the industrial, construction and marine fields.

He joined Detroit Diesel as a chief engineer when the Division was established in 1937. After serving also as head of the Division's inspection section, Mr. Truxell in 1943 was appointed director of engineering and sales of the newly-established Diesel Equipment Division in Grand Rapids, Michigan. Here he continued his association with the Detroit diesel engine as many of the products manufactured by the new division were Detroit diesel engine parts. Mr. Truxell returned to Detroit Diesel as works manager in 1955 after serving for approximately two years as director of engineering and manufacturing at the Allison Division's Aeroproducts operations, Dayton, Ohio.

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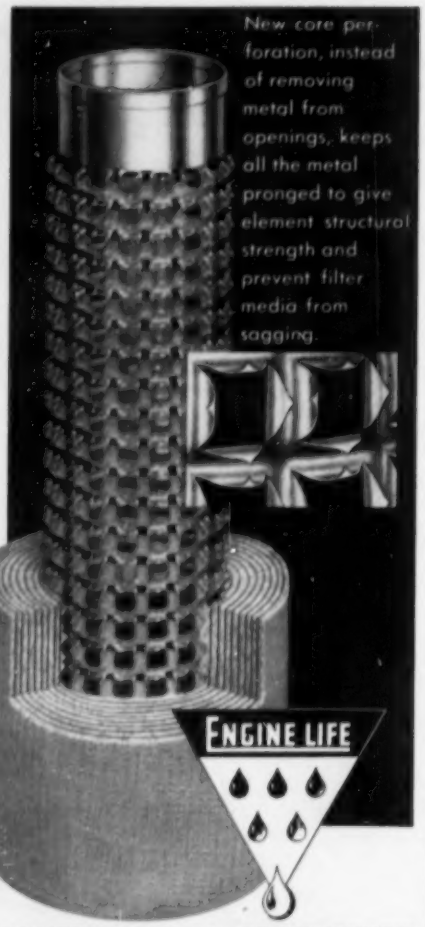
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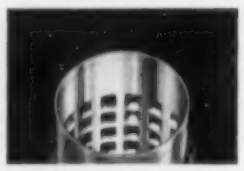
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EL MONTE, CALIFORNIA



Mid-Continent Diesel News

By **Jack F. Cozier**

El Paso Natural Gas Co., El Paso, Tex., has announced plans for a major expansion program for its natural gas pipeline system in New Mexico and Texas. New compressor station construction will include installing 5000 hp units at Laguna and Roswell with 2000 to 4800 hp additions at five existing plants. A 12,000 hp compressor station will be built at Chaco, and a 7700 hp addition is in the picture for the Lindrith field station with additions to be built at Blanco, Panoma and Waddell stations.

Contractors Machinery Co., Kansas City, Kan., purchased a GM model 4031-C diesel for installation on a Skagitt single drum hoist. The sale was made by K C Diesel Power Co., North Kansas City, Mo.

Merchants Fast Motor Lines, Inc., Abilene, Tex., has in operation four White trucks powered by Cummins HRBB diesel engines and six White Super Service trucks powered by NHB Cummins diesels. Merchants have six more White Super Service trucks on order. With 35 terminals, Merchants covers west, central and south Texas.

Breach & Frix, Muskogee, Okla., has recently put into operation a model 44 Lima shovel purchased from R. A. Young & Sons, Inc., Tulsa, Okla., powered by a GM 471 diesel engine with an Allison torque converter. The unit is being operated on the Will Rogers turnpike near Miami, Okla.

Fred E. Cooper, Inc., Tulsa, Okla., bought an A-C Buda model LO-525 natural gas engine from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, for installation on a pipeline pump.

Glenn Burgess Construction Co., Tulsa, Okla., purchased an S7 Euclid overhung scraper powered by a GM 471 diesel. The unit sold by Butler-Sparks Equipment Co., Tulsa, will be used on housing projects locally.

Ada Rig Co., Ada, Okla., has bought a Cat D7 tractor with bulldozer and Hyster worm-drive winch from McCormick Machinery Co., Tulsa, Okla. The unit will be used for moving large rotary drilling rigs to new locations.

Colorado Interstate Gas Co., Colorado Springs, Col., has received a Unit 614 combination backhoe and crane powered by a GM 271 diesel. The sale was made by Midwestern Engine & Equipment Co., Tulsa, Okla., with the unit to go into service for pipeline maintenance.

Worthington Corp., Tulsa, Okla., bought a Hercules JX4D gas engine from Hercules-Lupfer Engine Sales Co., Tulsa. The engine will be installed on a fomite pump and then resold to a major oil company for fire fighting usage.

Kansas, Oklahoma and Gulf Railway, Muskogee, Okla., have ordered two 1750 hp general purpose diesel locomotives from the Electromotive Division of General Motors. The two new locomotives will be placed in an equipment pool for use by KO&G and its two affiliate roads, Midland Valley railway and Oklahoma City-Ada-Atoka railway.

Jennings Engine Supply, Oklahoma City, Okla., has ordered a model PC-2505 A-C Buda natural gas engine from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, Okla. The engine will be installed on a pipe line pump and sold to a major oil company.

Tummelson Excavating Co., Tulsa, Okla., has repowered a Scoopmobile with a model 4330T GM diesel from the Diesel Power Co., Tulsa. The rubber tired front end loader is used for loading sand and other building materials.

H. D. Youngman Construction Co., Baxter Springs, Kan., purchased a No. 12 Cat diesel motor grader for use in work on the Will Rogers turnpike. The sale was made by McCormick Machinery Co., Tulsa, Okla.

List & Clark Construction Co., Kansas City, Mo., purchased two GM model 62306 diesels from K C Diesel Power Co., North Kansas City, Mo., for installation in model 12 TDT Euclid scrapers.

Kerr-McGee Oil Industries, Inc., Oklahoma City, Okla., has in operation the first platform and tender type drilling device to utilize diesel electric drive on location off Plaquemines parish, Louisiana. The drilling unit working for the Continental-Atlantic-Tidewater-Cities Service group has power supplied by three 875 hp engines each driving two 500 kw dc generators. The electric power is transformed back into mechanical power by eight 625 hp electric motors, all the power equipment was built by the Electro-Motive Division of General Motors.

Mid Continent Refinery, Tulsa, Okla., bought a 600 ft Chicago Pneumatic rotary compressor through Leland Equipment Co., Tulsa. The unit powered by a 671 GM diesel will be used for maintenance in the West Tulsa refinery.

Bell Engine Service, Great Bend, Kan., has ordered six A-C Buda model 6MO-970 natural gas irrigation engines from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, Okla. The engines will go into irrigation service in Kansas.

Superior Sand Co., Edwardsville, Kan., purchased a GM model 3057-C diesel for installation in a model 25 Northwest shovel. The engine was sold by K C Diesel & Power Co., North Kansas City, Mo.

Murray County, Sulphur, Oklahoma, bought a No. 112 Cat diesel motor grader from McCormick Machinery Co., Tulsa, Okla. The grader will be used for improving county roads.

O'Brien Contracting Co., Tulsa, Okla., has purchased a Unit 614 crane from Midwestern Engine & Equipment Co., Tulsa. The crane powered by a GM 2-71 diesel will be used locally for general contracting on buildings.

Boman Construction Co., Tulsa, Okla., has put into operation his third Euclid unit, the new unit being a model 14 TDT Euclid scraper powered by an NHB-275 Cummins diesel. The unit used for highway construction was sold by Butler-Sparks Equipment Co., Tulsa.

Power Transmission & Equipment Co., Seminole, Okla., received two 6MO-970 A-C Buda natural gas engines from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, Okla. The two go on a rotary drilling rig for operation in Oklahoma.

Latter, Inc., Topeka, Kan., purchased a GM model 2055 diesel for installation in an Allis-Chalmers model HD-5 crawler tractor. The engine was sold by K C Diesel Power Co., No. Kansas City, Mo.

Fred E. Cooper, Inc., Tulsa, Okla., bought a model 4BD-153 A-C Buda diesel power unit from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, for installation on a pipeline pump.

K & P Oil Co., Wewoka, Okla., is installing an International 282 gas engine from Carson Machine & Supply Co., Tulsa, Okla., on an oil field pumping unit at Wewoka.

Stowell Corp., Tulsa, Okla., had a Byers Crane repowered with a GM model 4030-C diesel supplied by Diesel Power Co., Tulsa, for use around a ready-mix concrete plant.

Jennings Engine Supply, Oklahoma City, Okla., purchased an Allis-Chalmers model PC-1879 natural gas power unit from Allis-Chalmers Mfg. Co., Buda Div., Tulsa, Okla., for a pipeline pump installation.

Joins Naval Architects' Firm

Coe M. Best, Jr. has joined the staff of Friede and Goldman, Inc., Naval Architects and Marine Engineers of New Orleans. Mr. Best has previously been a civilian naval architect at Pearl Harbor and San Francisco Naval Shipyards, and had been successively with Calmes Engineering Co. as Chief Engineer, with Ingalls Shipbuilding Corporation, and with Higgins, Inc. He is a graduate of the University of Michigan with a degree in Naval Architecture and Marine Engineering.

Western Region Manager

Robert F. Harwick has been named manager of the Western region of the Du Pont Company's Petroleum Chemicals Division with headquarters in Los Angeles, it was announced today by David H. Conklin, director of sales. George L. Tyler becomes assistant regional manager. William B. Gest has been named manager of the newly formed Cleveland, Ohio, district. A chemical engineering graduate of the Drexel Institute of Technology, the new Western region manager was West Coast editor of the Oil and Gas Journal before joining the Du Pont Company early in 1950. Before that, he was with the Gulf Oil Corporation for 14 years, both at the Girard Point Refinery in Philadelphia, and as a member of that company's advertising and sales promotion staff, headquartered in Pittsburgh.

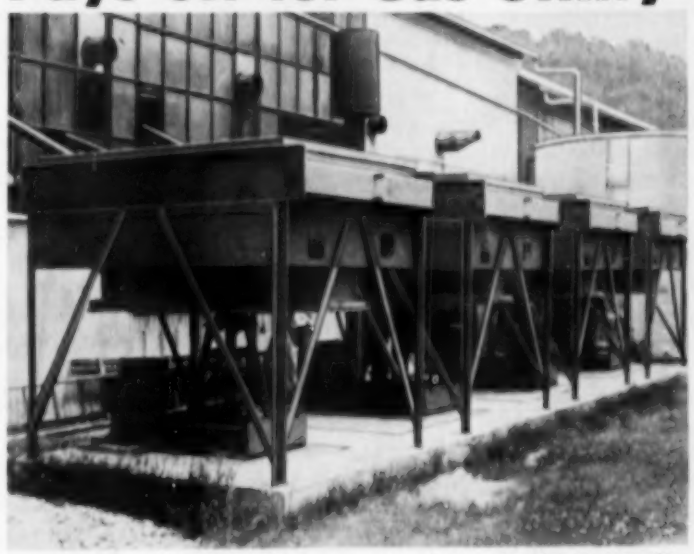
After joining the Du Pont Company's Petroleum Chemicals Division, Mr. Hardwick became sales promotion manager of that division, then assistant manager of the Gulf Coast region. While Mr. Hardwick was sales promotion manager, the famous Du Pont Magic Barrel, the Quarterly Gasoline Survey, Fuel Test Fleet, and Consumers Buying Habits Survey were all developed under his leadership. Just prior to his new assignment, Mr. Hardwick was assistant manager of the Akron district office of Du Pont's Elastomers Division. He also served for a short time as assistant sales development manager in that division.

Diesel Hydraulic Locomotive

During July 1956 Baldwin-Lima-Hamilton delivered to the Alabama Power Company at their Gorgas Steam Plant, Gorgas Alabama one 40-ton Baldwin diesel-hydraulic locomotive, equipped with a model NHRBIS-600 Cummins diesel engine rated 300 hp. This new locomotive will be used in the switching of coal cars for this steam power plant normally; but, upon delivery will be used in the construction work of the new Plant extension.

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Pays off for Gas Utility*



*South Penn Natural Gas Co. Station, Smithfield, West Va.

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eliminate cooling water supply problems



Young HC Horizontal Core Cooler and Condenser

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Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

THE LARGEST ENTERPRISE DIESEL

THE RV-16, prototype of a new line of industrial diesel engines, has been recently completed by Enterprise Engine & Machinery Co., San Francisco. Already sold to the government of Saudi Arabia, the new engine is completing dynamometer tests that verify its rating of 7700 bhp at 400 rpm. By far the biggest engine Enterprise has built—and the company's first V-type engine—the RV-16 is still small in size by industrial diesel standards. V-design advantages have been enhanced by a novel master-slave arrangement of connecting rods that puts opposing cylinders in the same plane. RV engines will be built in 12- and 16-cylinder models. They will provide power for main propulsion in big towboats and seagoing freighters, power for electric generation in municipal or industrial plant applications, and power for oil or water pumping stations. The comparatively small size of the Enterprise RV-16 in relation to its horsepower output primarily because of its connecting rod design has attracted a great deal of interest in the Diesel Industry.

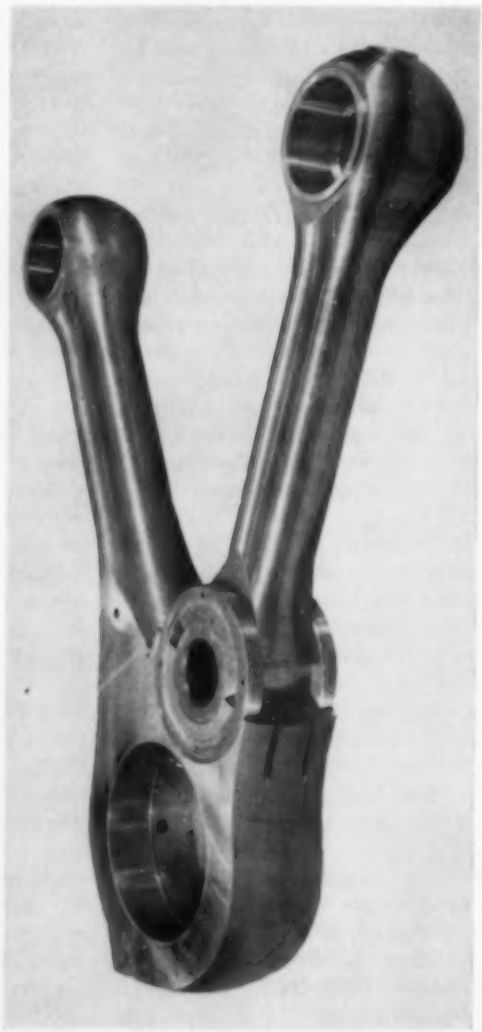
The RV-16 was designed by Don Morris, principal design engineer, under the guidance of John Sheusner, manager of operations at Enterprise. The bare engine weighs nearly 182,000 lb. It is 20½ ft long, 9½ ft wide, and 11½ ft high. Equipped with four Brown Boveri VTR 320 turbochargers, the engine now on test weighs 189,100 lbs. Its length totals 26 ft 4 in., and height 12 ft 1 in. For interchangeability, and to maximize savings in length, the RV design incorporates cylinder specifications from the Enterprise R-series engines, 17x21-in. bore and stroke. The R-series cylinder center distance of 24 in. necessitated the unique connecting rod construction in order to keep the bearing and bushing loads to conservative values.

For each pair of pistons in the RV-16, there is only one rod connected in conventional manner to the crankshaft. The other rod is a short slave linked to the master rod. This arrangement means only eight connecting rod bearings and therefore permits greater crankshaft bearing area for the thrust from each piston. Areas are additionally increased by a re-entrant fillet design in the crankshaft. Together with other design aspects, the bearing construction gives the RV-16 a calculated load carrying capacity 2.8 times that of the Enterprise R-series diesels. Normally aspirated or turbocharged, the RV can be furnished to operate on diesel or heavy fuel, as a dual fuel engine, as a spark-ignited gas engine, or as a tri-fuel plant—the latter being a nearly universal arrangement capable of burning diesel oil alone, or gas ignited either by pilot oil or by spark.

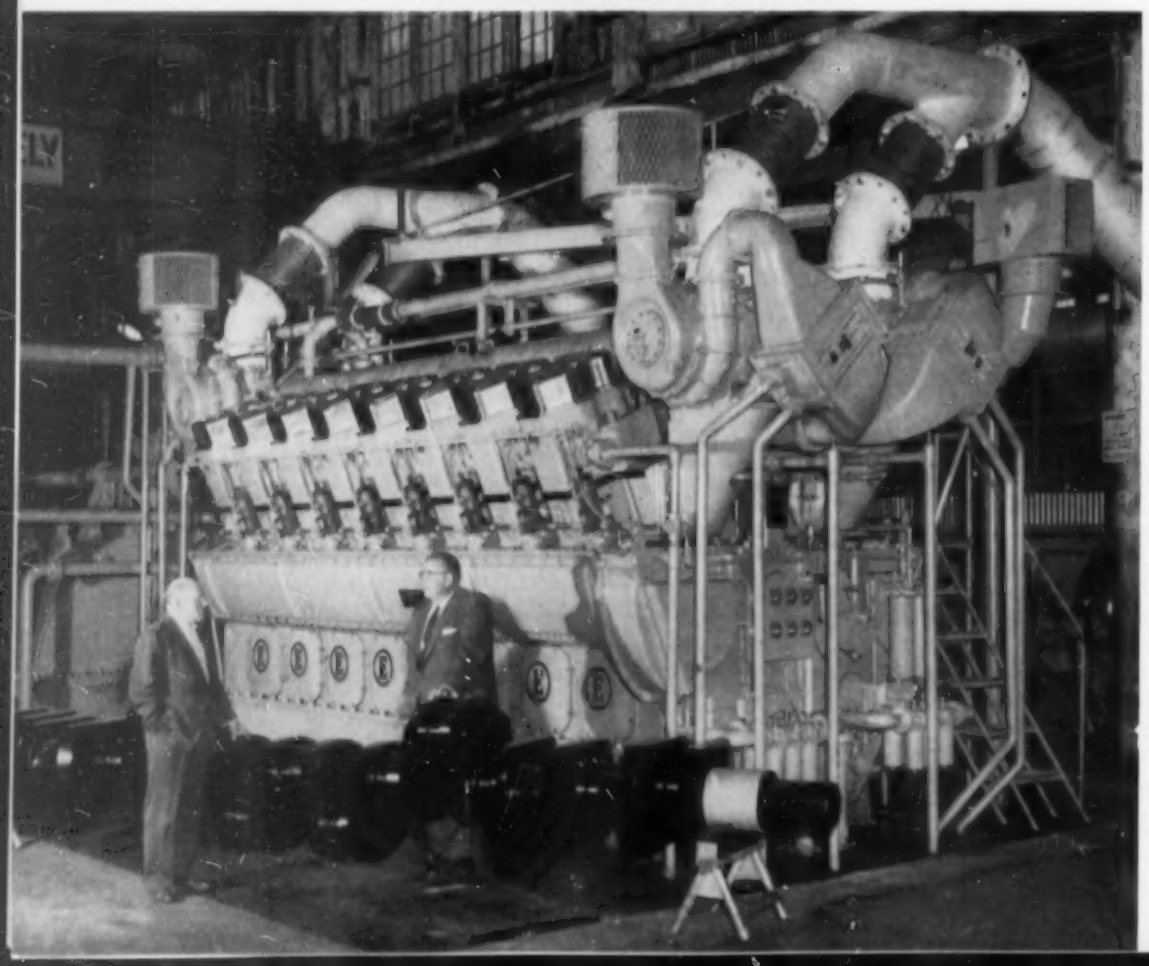
For practicality in manufacture, shipment, installation, and maintenance, the RV engine frame is built in four pieces—base, crankcase, and two identical cylinder blocks, all of cast iron for maximum rigidity. The units are connected by through bolts and long bolts, with metal-to-metal joints sealed by rubber rods compressed in grooves. A welded steel frame design has also been provided. With low mechanical loadings guaranteed by unusually large bearing areas, the RV-16 also operates with very low thermal loadings, due to design provisions for piston cooling.

The ribbed undersides of pistons provide greater cooling surface against which lube oil is thrown by inertia—what Enterprise terms a cocktail shaker effect. This inertia pressure far exceeds normal oil pressure, so further special design was undertaken to prevent return flow to the connecting rod bearing. The solution was to use the crankshaft itself as a rotary valve. This has the further advantage of minimizing additional moving parts. It also eliminates the need for oil grooves in the most highly loaded halves of the bearings.

The articulated connecting rod of the new RV engine. This design permits opposite cylinders in the V to lie in the same plane, which reduces over-all length of engine by more than 20%. The rack tooth joint of the master con rod distributes the stresses in the joint over the greatest possible area, and allows for removal of entire assembly by release of six clamping bolts and withdrawal of the assembly through the liner.



Mr. John Sheusner, left, Manager of Operations, and Mr. Wm. Clausen, Executive Vice President and General Manager, are shown in front of the new 7,700 hp Enterprise RV-16 diesel discussing a huge crankshaft of the size used in the engine. Brown Boveri turbochargers can also be seen.



Change in Company Structure



Charles A. Winslow



William G. Nostrand

Retirement of Charles A. Winslow, founder and for more than a quarter of a century president of the firm, has been announced by Winslow Engineering Company, Oakland, Calif., along with news of changes in the company's corporate structure. Mr. Winslow, nationally recognized pioneer in the development of full-flow filtration systems for fuels and lubricating oils used in internal combustion engines, will retain a seat on the organization's Board of Directors and will continue to serve as a consultant on engineering problems. In addition, he will continue as president of Winslow Aerofilter Corporation, a new firm established May 1 of this year for the manufacturing, installation and servicing of filters and elements used on aircraft.

With the original company's name changed on July 1 to Winslow Engineering and Manufacturing Co., the new president is Laurence L. Moore, former executive vice president. Moving into the latter position is William G. Nostrand, who had been vice president in charge of sales and engineering. Nostrand, at the same time, becomes president of Winslow Engineering Inc., operating a filter manufacturing plant in Murray, Ky. Moore serves as the number two man in that organization. Retiring with her husband is Mrs. Catherine B. Winslow, who has been secretary-treasurer of the firm for many years. She remains in that capacity with the Aerofilter corporation, but her place in the engineering company is being taken by John Larson.

Dairy Tractor Converted to Diesel



This Ford F900 gasoline tractor, owned by the Ira Wilson and Sons Dairy Company of Detroit, Michigan, was recently repowered with a Cummins JT6B Turbo-Diesel by Cummins Diesel Michigan Inc. of Detroit, and is said to be the first conversion of this nature in the area. Shown with the tractor and one of the two tandem milk-tank trailers it pulls regularly are (left) Stanley L. Wilson, President, and (right) Raymond E. Mitchell, Service Manager of Wilson Dairy Company.

New Officers Elected

C. P. Kottlowski has been elected President and General Manager of Diamond Chain Company, Inc., Indianapolis, Indiana, succeeding Guy A. Wainwright, who became Chairman of the Board replacing C. C. Jarchow. H. Norris Cottingham, Vice President, was named Assistant General Manager; and G. E. Schloot was named Vice President and Director of Personnel. Mr. Kottlowski joined the Company in 1916 immediately after his graduation from Purdue and has formerly been Assistant General Manager. Mr. Cottingham has been with the Company since 1919. He is a member of the Rotary Club and a director of the Indianapolis Community Chest. Mr. Schloot, formerly Factory Manager, graduated from Purdue in 1917 and has been with the Company 39 years.

Nickles Appointments

H. A. (Bob) Morris has been promoted to the position of sales manager of Nickles Machine Corporation, Ponca City, Oklahoma. Morris, who joined Nimco in 1954, has had many years experience in the industrial engine maintenance field. He will make his home in Ponca City, where he has been joined by his wife and daughter. Morris is succeeded as Permian Basin representative and sales engineer for Nimco by Jack M. Ray, who joined the company as salesman last year. Ray will make his headquarters in Odessa, Texas.



EATON VALVES are Backed by 35 Years of Diesel Engine Experience

Eaton Diesel Engine Valves are produced to meet the exacting requirements of Diesel engine service. Through more than 35 years of co-operating with the country's leading Diesel engine manufacturers, and furnishing valves to them, Eaton has developed a thorough understanding of the problems peculiar to the Diesel field. Eaton's experience is reflected in the outstanding performance records achieved by Eaton-made valves in all phases of Diesel engine service.

Eaton Diesel Valves are produced in a wide range of materials, and in both faced and unfaced designs.

Our engineers will welcome the opportunity to discuss the application of Eaton valves to your engines.

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VALVE DIVISION
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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springfites Spring Washers Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Mid-West Diesel News

By L. H. Houck

J. A. TOBIN Construction Co., Kansas City, Kan., has purchased a Model 175A Michigan Tractor Shovel powered with a Waukesha 6 cyl. diesel, 426 cu in., Model 135DKB. Sale was made by Dunn Machinery Co., Kansas City, Kansas and the machine is at work on the Kansas Turnpike.

HOMER ROGERS, Camdenton, Mo. has purchased an Allis-Chalmers HD-6-B, with dozer equipment from Chiles Tractor and Machinery Co., Springfield, Missouri.

AN INSLEY WB dragline has been delivered to H. A. Tucker Const. Co., Newport, Ark., by Chiles Machinery & Tractor Co., Springfield. Power is a 4-71 GMC 2-cycle diesel.

ABOUT 50 Michigan tractor shovels, manufactured by Clark Equipment Co., Benton Harbor, Mich., have been sold in the Kansas City area during the last 18 months, according to Charles Dunn, manager of the Dunn Machinery Co., Kansas City, Mo., who made the sales. All were powered with Waukesha 6-cylinder diesel engines.

A dieselized pile driver hammer has been announced by McKiernan-Terry Corp., pioneer makers of steam hammers, which does away with steam boilers, air compressors and associated machinery. Entirely self-contained it has a 3000-lb ram which delivers 45 to 55 strokes per minute at an average force of 18,000 ft-lbs. A smaller hammer is also planned for early production. Both items are certain to be popular with contractors.

AN Allis-Chalmers Model 45 motor grader, one of the latest in the line, has been delivered to the West Plains, Mo., Special Road District by Chiles Tractor and Machinery Co., Springfield.

HARBISON-WALKER Refractory Co., nationally known firebrick manufacturers, recently placed a Caterpillar D2 in service from Fabick & Co., Jefferson City, Mo.

BURFORD Mining Co., DeSoto, Mo., is using a Marion 43M shovel, powered by a GMC 4-71 diesel to load out trucks for the mill haul in its barite mining operation. The company also uses a dieselized Allis-Chalmers HD21 in its mining operation.

CITY OF ELDON has taken delivery on a Caterpillar tandem drive No. 212 grader from Fabick & Co., Jefferson City, Mo.

LIMA Crane, Model 34, owned by Alex Cohen, Indianapolis, Ind., has been repowered with a 110 hp Model HRCIP-400 Cummins diesel from Cummins Diesel Sales Corp., Indianapolis.

AAA ENGINE & Electric, Inc., Kansas City, Kan., W. J. Hewitt, manager, has been appointed KC territory distributors for Waukesha diesel and gas engines, and will handle both sales and service. They will also handle the new line of Waukesha diesel generator sets running from 50 to 600 kw.

SHERMAN Const. Co., Wichita, Kan., excavation contractor on the Lebanon Bypass U. S. 66 job, has an impressive array of new diesel equipment. A new Lima 703 shovel christened on this job has a 6-71 GMC diesel with Allison torque converter. Other items are three Euclid bottom dumps with GMC diesels, being pulled with 23TDT tractors with 6-71 GMC's and Allison converters.

CATERPILLAR D6 with 6S bulldozer and hydraulic control has been deliver-

McWILLIAMS BLUE LINE PICKS GM TURBOCHARGED DIESEL POWER

To tote barges faster on canal routes, McWilliams Blue Line has specified a 2,000-horsepower General Motors Turbocharged Diesel for its newest tug. The boat will have a retractable pilot house to permit it to clear low canal bridges. Turbocharging gives a GM Diesel 75% more power with virtually no increase in engine size and a big reduction in weight per horsepower. And horsepower-for-horsepower, a GM Turbocharged Diesel costs less to install, run and maintain. If you need power for tankers, towboats, tugs, cargo ships, dredges—or any other application—specifying a GM Turbocharged Diesel will give you a far greater return on your investment. See your local Cleveland Diesel Engine Division Representative for full details or write direct.



Builder: Calumet Shipbuilding and Drydock Company, Chicago, Illinois

CLEVELAND DIESEL

An Engine Division of General Motors • Cleveland 11, Ohio



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Honolulu, T. H., 3115 Diamond Head Road. Tel.: Honolulu 99-9202
Miami, Fla., 2315 N. W. 14th Street Tel.: 64-2852
New Orleans, La., 727 Baronne St. Tel.: Magnolia 0761
New York, N. Y., 10 East 40th Street Tel.: Murray Hill 3-4372
Norfolk, Va., 354 Front Street Tel.: Madison 2-7147
Orange, Texas, 212 First Street Tel.: Orange 8-4226
Pittsburgh, Pa., 469 Marlin Drive Tel.: Locust 1-2173
Portland, Ore., 3676 S. E. Martins St. Tel.: Prospect 1-7509
St. Louis, Mo., 2 N. Wharf St. Tel.: Main 1-0642
San Diego, Calif., 3886 Sequoia Street Tel.: Hutson 8-6883
San Francisco, Calif., 870 Harrison St. Tel.: Douglas 2-1931
Seattle, Wash., 1230 Westlake Ave. N. Tel.: Adler 1440
Wilmington, Calif., 433 Marine Avenue. Tel.: Terminal 4-6098

GM CLEVELAND DIESEL

ed to Sylvester Bohmann, a road contractor at Warrensburg, Mo., by Fabick & Co., Jefferson City, Mo.

FEDEROW Iron & Metal Co., Springfield, Mo., now has three Insley cranes with magnetic lifts, converted to diesels, using 3-71 GMC 2-cycle engines.

LEBANON, Mo. Bypass U. S. 66 job is almost all diesel. Among the units are Allis-Chalmers HD19, Model C LeTourneau-Westinghouse with Cummins, Caterpillar No. 12 graders and D8's, International-Harvester TD24's with Model P29 winch, Allis-Chalmers HD19, 21—most in more than one.

AN OILWELL Model 712-P drill rig used in the Illinois oil fields has been repowered by compounding two 180 hp Model HRFBI-600 Cummins diesels. Owner is F. H. Brown Drilling Co., Inc., Carmi, Ill., sale and installation by Cummins Missouri Diesel Sales Corp., St. Louis.

A DREDGE Pump in a dredge working on the Big Muddy has been repowered with a 300 hp Model VT-12-1 Cummins diesel. Owner is Fred R. McKinsey Co., and sale was made by Cummins Diesel Sales Corp., Peoria, Illinois.

RUSSELL TURK, Mt. Vernon, Mo., a custom grading contractor has bought an Allis-Chalmers HD11-B from Chiles Tractor and Machinery Co., Springfield, Mo., along with a TR-11 ripper.

MOSS Oil Co., Bowling Green, Mo., has placed a Mack tractor with Thermodyne diesel engine in tanker service between Jefferson City and Bowling Green, hauling for the Phillips pipeline station.

R. H. SHEPPARD & Co., has introduced a new diesel to be handled by Mid-West dealers. It is tagged the 17A and is comparable in weight and size to an average 20 hp gasoline engine. It is a 2-cyl. job, with 3½-in. bore, 4-in. stroke and 76.8 cu in. displacement. It is offered as an open power unit which will attract the interest of farmers as well as industry, standard, closed power unit or as a diesel generating unit of 5 to 7½ kw.

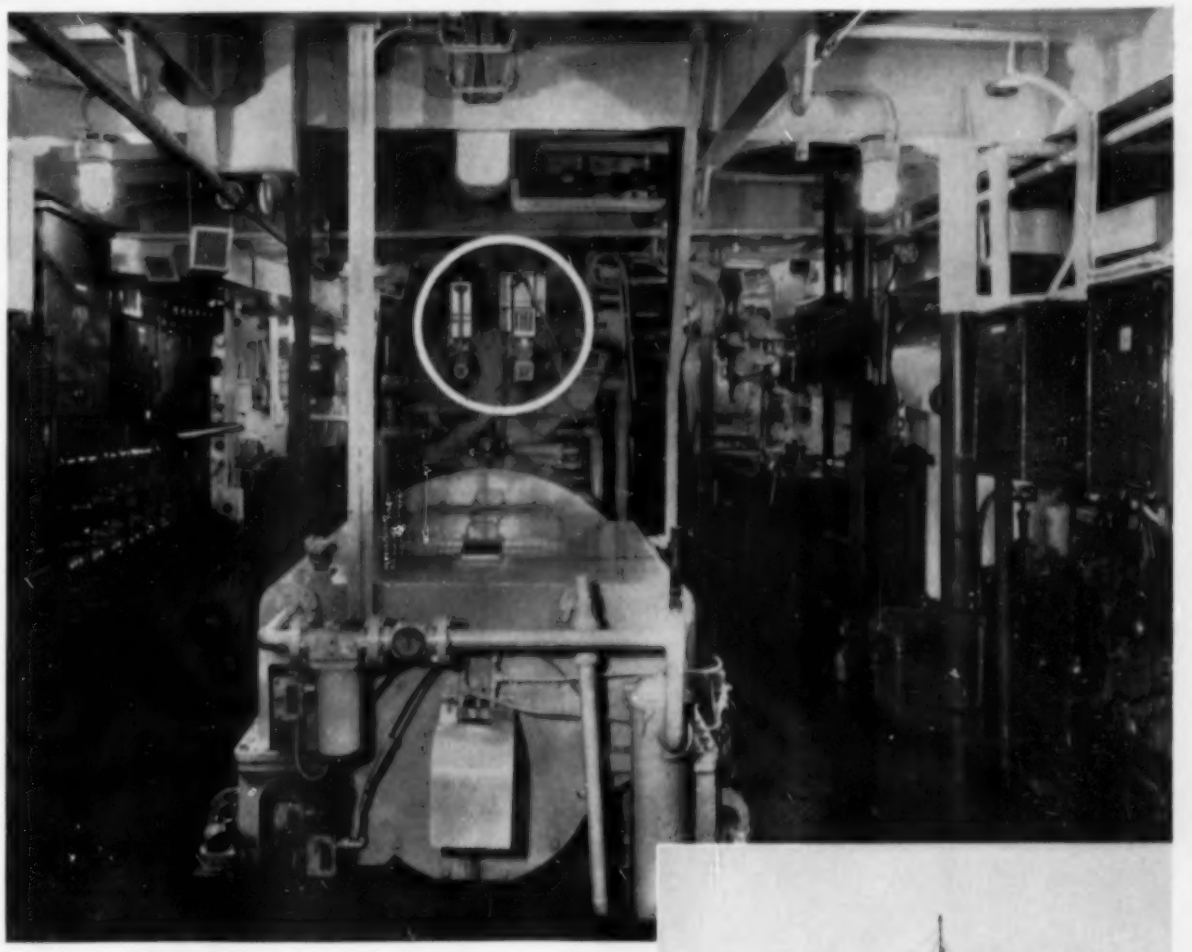
ANOTHER big truck line converts to diesel. McLean Trucking Co., Winston-Salem, N. C. is taking delivery on 50 GMC Model DF662-47 COE sleeper cab tractors with GMC 4-71 diesel engines, to add to its over the road common carrier fleet.

ALLIS-CHALMERS has started construction on its new St. Louis branch which will replace leased quarters and speed the handling of parts and machinery for its Midwestern dealers. W. W. Shutt is branch manager. Building is on a 10-acre site in the new industrial area on Linbergh near Hazelwood.

CONTINENTAL has entered the diesel truck field with its new diesel being offered in the new Brockway Model 255-W tractor for over-the-road haulers. Midwest dealers are featuring the new equipment. The Brockway uses the Continental Red Seal Cushioned Power diesel Model RD-6572.

PEARL WOOD, Hyden, Ky., has repowered an F-900 Ford with a 175 hp JT-6-B Cummins Turbo diesel. Installation and sale was by Cummins Diesel Sales, Louisville.

NOW AVAILABLE! The Completely new Volume 21 of **DIESEL ENGINE CATALOG.** This giant, fully illustrated reference book containing complete and detailed engine and accessory sections is bigger, better than ever before. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company order forms to **DIESEL PROGRESS**, 816 N. La Cienega Blvd., Los Angeles 46, California.





Marquette
HYDRAULIC GOVERNORS
assure all-weather efficiency
for heavy duty tug "Grampus"

A Marquette Governor and Overspeed Trip provide accurate and dependable regulation of 1,700 horsepower on this 105-foot tugboat, newest addition to the offshore fleet of the G & H Towing Co., Galveston, Texas.

The "Grampus" is assured of full, steady power under all conditions. Even in stormy weather she can efficiently tackle the biggest jobs.

Marquette Governors are daily proving their dependability and accuracy on thousands of tugboats, river towboats, motor vessels, dredges, ferries, trawlers, freighters, fishing boats and on miscellaneous vessels operated by the United States and foreign governments.

Our engineering facilities are at your disposal for solving all problems of power control—on sea or land.

Massey GOVERNORS

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Other Marquette Products: AIRCRAFT WINDSHIELD WIPERS • ANTI-FRICTION BEARING TEXTILE SPINDLES • SPRING CLUTCHES PRECISION PARTS AND ASSEMBLIES • ROTARY OIL PUMPS

Northeast Diesel Notes

By Arnold B. Newell

THE Gillette Safety Razor Company has just put into operation a new Fairbanks Morse O-P diesel rated 1920 hp sold by the Boston Branch. This is an O-P unit equipped with a Maxim Model BVS combination silencer, waste heat steam generator economizer.

A NEW Cooper-Bessemer diesel will be added to the central power plant on Martha's Vineyard. Particulars will be available later.

THE MERRITT, Chapman & Scott New York Shipbuilding Division of Dresser Industries at Camden, N. J. will build two motor vessels for Marine Drilling and Construction Company of Houston, Texas. One will be a 2500 ton drilling tender and the other is a 297 ton cargo supply ship. A matter of considerable interest is the fact that the drilling rig tender is to be self propelled with the diesels normally installed for tender service.

THE HARTFORD, Connecticut Water Bureau is removing obsolete power equipment and replacing it with eight 500 hp Caterpillar diesels sold by the H. O. Penn Company, Newington, Conn. branch.

NEW YORK City is having plans drawn for conversion of one of its fire boats to diesel propulsion and construction of three new ones. The naval architect is H. Newton Whittlsey of New York City.

A 55 FT trawler, *Edna G*, has been delivered by the Morehead Shipbuilding Co. of Morehead, N. C. to Guido Grasso of New Haven, Conn. Propulsion is by a G M 6-110 and auxiliary power is an Onan 3 kw.

LANE Construction Company of Meridan, Conn. has purchased eight new Cat dozers, Model D 8 from H. O. Penn Machinery Company for use on thruway construction.

AN INTERESTING group of three sales of identical equipment to three different customers was made by the Boston branch of International Truck Division of I-H. These were the DCO 225 trucks for use in delivery of baby chicks and eggs on long-haul runs. One was purchased by Arthur R. Miller of Cross St., Halifax, Mass.; the second was taken by Edward W. Lea of 101 Auburn St., Brockton, Mass. and the third by Donald W. Parsons of 295 Belmont St. in Brockton. These diesel trucks are for fast, long-haul deliveries.

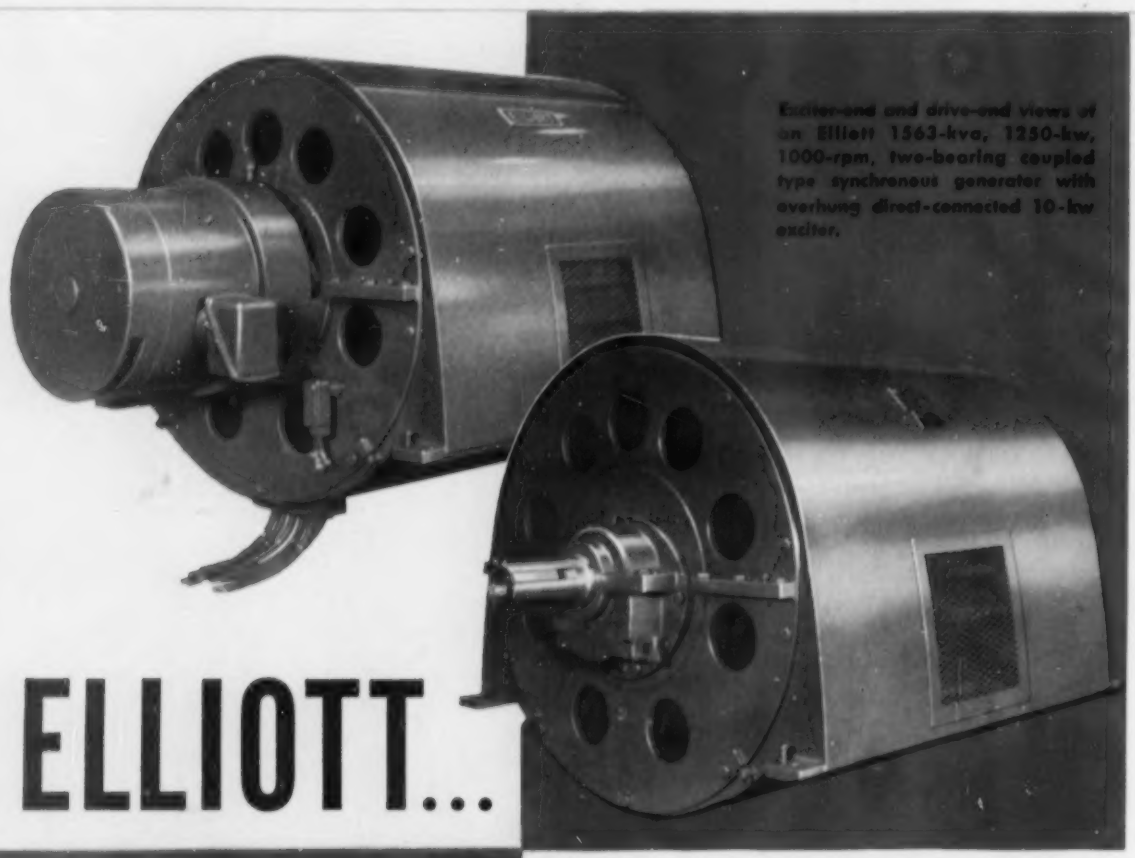
CUMMINS Diesel Sales Corp. of Bronx, N. Y. has supplied a Cummins diesel, rated 110 hp to Lou's Auto Wrecking Corp. of Garden City, L. I., for installation in a Byers truck crane.

THE New York City Department of Sanitation has purchased a 50 kw generator set, powered by a Cummins 165 hp diesel, also sold by Cummins Diesel Sales Corp. of the Bronx.

THE SOUTH Atlantic Trading Corp. of New York City informs us that they have shipped 9 General Motors diesel locomotives to Brazil and six more will be shipped later. At the same time, Higgins, Inc. of New Orleans announces that Brazil is buying from them six ultra modern diesel driven ferryboats.

A 39 FT sport fisherman to be powered by a 225 hp General Motors diesel is to be built by Antone Correia of Middletown, R. I. for Steve Prasteras of Newport. The sale was made by Hobbs Engine Company of Cambridge, Mass.

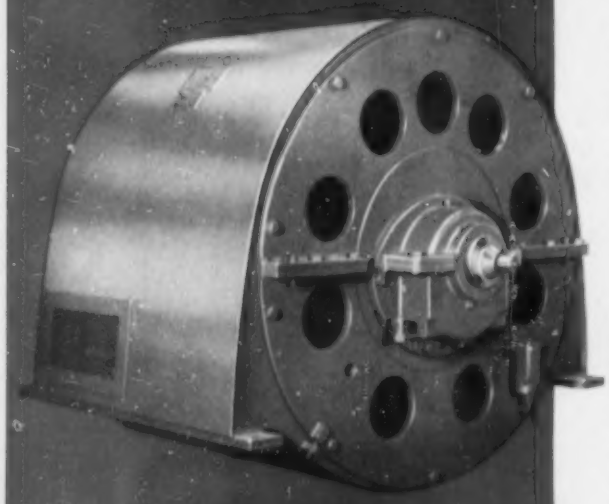
IPSWICH, Mass. having one Fairbanks



Exciter-end and drive-end views of an Elliott 1563-kva, 1250-kw, 1000-rpm, two-bearing coupled type synchronous generator with overhung direct-connected 10-kw exciter.

ELLIOTT...

ANNOUNCES A NEW LINE OF HIGH-SPEED A-C GENERATORS



An Elliott 1413-kva, 1130-kw, 900-rpm, single-bearing, coupled type synchronous generator with stub shaft extension for a belt-driven exciter.

FEATURING NEW FLAT BEARING BRACKETS of rigid plate construction. These brackets assure vibration-free operation and yet are lightweight for ease of handling during maintenance operations. The split construction of the bracket permits quick removal of the upper half for periodic inspections. The large holes provide easy access to generator collector-ring brushes and permit unrestricted flow of ventilating air into the machine.

There are a variety of frame enclosures available with either one or two bearings of the ring- or pressure-lubricated type. The frame design minimizes the possibility of recirculation of ventilating air through the machine.

For complete information, consult your local Elliott field engineer or write Elliott Company, Ridgway, Pennsylvania.

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EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

Morse diesel on dual fuel and another burning automobile engine crankcase drainage has ordered another O-P of 1920 hp from the F M Boston branch. This last engine will be set up to burn Bunker C.

A Caterpillar D 9 dozer has been sold to D. V. Frione of New Haven by the Newington, Conn. branch of H. O. Penn. The service is contracting.

A G-M 6-71 drives the new 40 ft party fishing boat *Hyannis* now operating out of Hyannis, Mass. The boat was built at the Harvey P. Gammage yard at South Bristol, Maine and will operate in the Cape Cod area.

WOLFBORO, N. H., said to be America's oldest resort has purchased a 10-cylinder Fairbanks Morse O-P diesel rated 1600 hp for operation on Bunker C fuel in the generation of municipal electric power.

ONE of the few remaining small steamboats in passenger service operates between New London, Conn. and Block Island, but it will not be a steamer for long. A Cummins 500 hp diesel will replace the steam machinery after the current season is over. The boat does not operate in winter.

AN International R D S 230 diesel driven truck equipped with a mixer body has been sold to Eisenhauer & Chellstop of West Hartford by the I-H branch at Hartford. This model is one of the big Cummins diesel equipped units.

Engines for Oil Industry

Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, announces that all models of its oil-field engines and power units manufactured at its West Allis, Wis., Works and Harvey, Ill., Works are now available to the petroleum industry through all of its engine dealers. These include its Models B-125 and W-226 which have been available heretofore through Fred E. Cooper, Inc., Tulsa. The Cooper firm continues to represent Allis-Chalmers in the Tulsa area and will now handle the sales and service of the complete line of natural gas, butane, propane, diesel and gasoline engines in sizes from 9 to 516 hp.

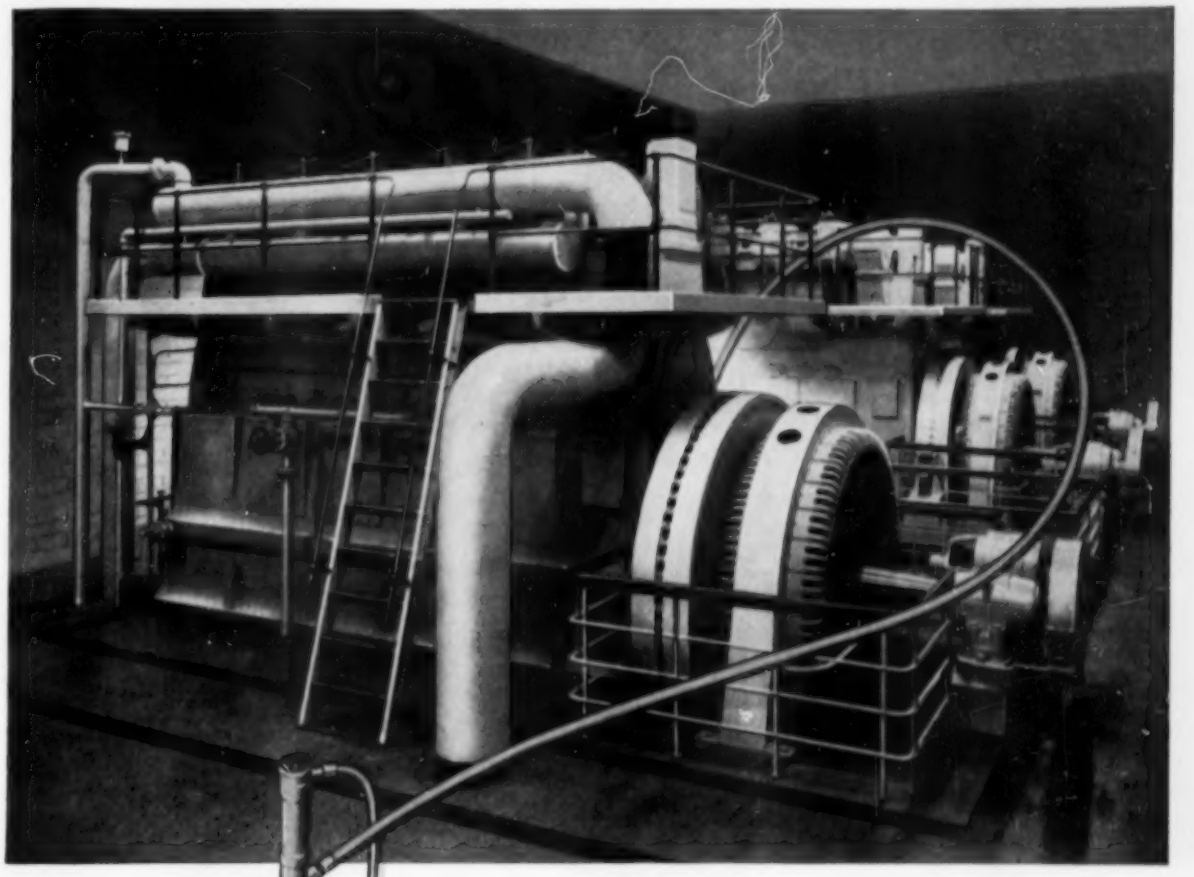
Heat Resistant Paint

A new quick-drying heat resistant paint for use on surfaces subjected to temperatures up to 600° F. is announced by Speco, Inc., Cleveland. Known as Heat-Rem QD Black, it air dries to a tough, bright finish in less than 2 hours. In addition, it is reputed to achieve maximum effectiveness without special baking and to have no objectionable odor during application. It can, as a result, be used in any quantities without interrupting regular work schedules. According to the manufacturer, QD resists extreme temperature variations, smoke, moisture, fumes, mild industrial acids and alkalis. It is recommended for protecting steam lines, vats, separators, exhaust manifolds, stacks, tanks, ovens and heat lines.

Applied by either brush or spray, QD covers approximately 500 sq ft per gallon. It is available in quart and gallon cans, 5-gallon pails, 30 and 55-gallon drums. QD is a companion product of Heat-Rem H-170, extra-high heat paint for temperatures up to 1700° F.; Standard Heat-Rem, which is adaptable for application in the 1000° to 1500° F. range, and HSE Black, which resists temperatures up to 750° F. For full details, write Speco, Inc., 7308 Associate Avenue, Cleveland 9, Ohio. Ask for form 4261. (ITS NEW)

Anyhow, accelerators were made to be stepped on, not to be toyed with. If the gasoline motor can't take it the diesel can.

Stops Sludge!





Guard your Diesel against sludge and carbon deposits — switch to Sinclair RUBILENE®, the lubricating oil with over 35 years of proven performance. RUBILENE's top quality means protection against "stuck rings"— prevents excessive wear of cylinders, pistons and other vital moving parts operating continuously for long periods. Sinclair RUBILENE pays off in reduced maintenance and less work during overhauls. Your Diesel stays on the job longer!

Switch over to RUBILENE. Regardless of the age or make of your Diesel, there's a member of Sinclair's famous RUBILENE or RUBILENE H.D. family that meets your needs exactly! Call your local Sinclair Representative or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

SINCLAIR

RUBILENE OILS

Florida Diesel News

By **Ed Dennis**

A UD 264 International diesel rated 52 hp at 1600 rpm, supplies the power for the new #303 Galion road grader that the City of Boynton Beach received from the Miami branch of Florida Georgia Tractor Co.

TWO Manitowoc cranes powered with Cummins HBIS diesel engines, one for Hercules Concrete Pileing C. the other for Bechtell Equipment Co.

A Worthington diesel rated 180 bhp at 600 rpm with an Electric Machinery 156 kva generator, 480 volts, 187 amps, at the Westwood Lake Water & Sewer Dept., for emergency use.

A Cummins diesel for the *Jungle Queen* of Fort Lauderdale, the model N. H. M. 604 has a Twin Disc 4.4:1 hydraulic r&r gears. Cummins Diesel Engines of Florida supplied the engine for this sightseeing vessel skippered by Capt. Al Start.

THE CITY of Fort Lauderdale received a model 88 Austin-Western grader powered with a GM 3-71 diesel and B. B. Doan received a Le Tourneau-Westinghouse dozer with a General Motors 6-71 diesel.

INSTALLED at Daytona Beach Boat Works, two Hercules of the DIX 6 series, each diesel is rated 150 hp at 3000 rpm, with Paragon 2:1 r&r gears, on the 55 ft yacht *Rubi-Yat IV* owned by R. James Trane of Trane Co., Scranton, Pa., sold by Auto Marine Engineers of Miami.

AWAITING shipment to St. Marc, Haiti, 9 Caterpillar tractors plus an S7 Euclid tractor and scraper with a General Motors 4-71.

JACKSONVILLE will have the first annual Southeastern Boat Show at the Greater Jacksonville Fair, October 25th to November 3rd. Thirty thousand sq ft of canvas will house the show in the Gator Bowl.

RECENT Cummins hi-way tractor-trailer installations included W. M. Howards International with a JT turbocharged diesel and an NHB for a Diamond T owned by Howard Altman Jr. of Jacksonville.

THE *Caonabo* a 150 ft freighter owned by Astilleros Dominecanoes C. P. A. of Puerto de Haina, Dominican Republic, with two General Motors 8-268A diesels and Marquette governors plus 2 GM powered 30 kw Delco generating sets.

CATERPILLAR Tractor Corp. paid $130,000 for 5 acres of land in Hialeah and expects to erect a 48,000 sq ft parts depot for South Fla. and the Caribbean areas. The value of the property and buildings is estimated to be in excess of a half million dollars. This marks the event of another big manufacturer of diesels expanding to Florida.

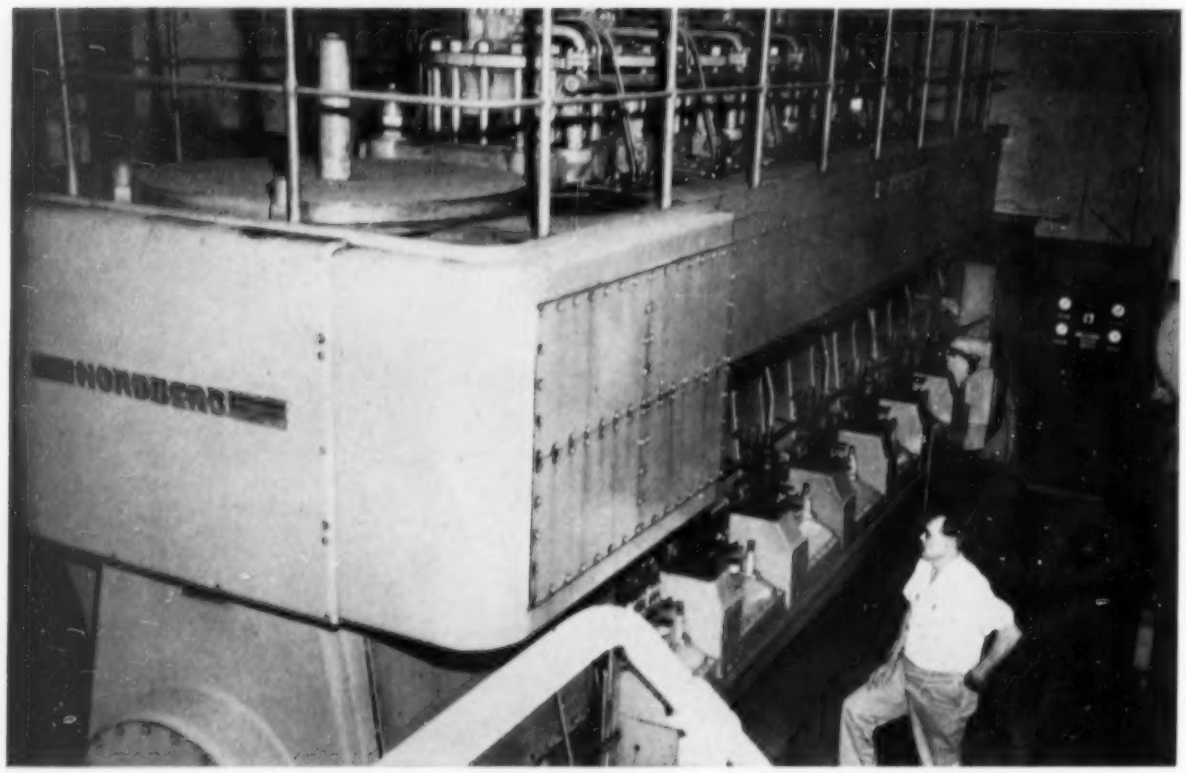
REPOWERED with a Buda diesel from a gasoline engine, a 52 foot Ketch at J. Frank Knorr, Miami. The model 6 DAMR 273 is rated 85 hp at 2800 rpm with 2.5:1 Snow Nabstedt r&r gears.

SHELLEY Tractor & Equipment Co. repowered a General road roller with a D311 Caterpillar diesel for the Naranja Rock Co. of Naranja and two D8 Caterpillar dozers with direct drives.

RECENT GM dieselized construction equipment installations included a 3-71 in a Rayall, multi purpose road grader for Reginald Moss of No. Miami and Warren Prescott took delivery of a #44 Lima 1 yd dragline with a GM 4-71.

AT KEY LARGO, Alonzo Cathron

Look to COOK for Better Rings!



Cook rings save $18 per day on one 2400-hp Diesel engine

WHEN a switch was made to Cook Piston Rings, Key West Electric's No. 12 Diesel showed a saving of $41,670, for 55,542 operating hours — *an average saving of $18 per day!*

There are good, built-into-the-ring reasons why a switch to Cook almost inevitably leads to more efficient performance, more dollar savings. Cook rings are re-turned as a final manufacturing process . . . they're light-tight, conform perfectly to the cylinder wall. This prevents scuffing and power-stealing blow-by. Also, Cook rings are tensioned by a unique, gentle "squeezing" process. Result: constant, uniform tension that *never* wears out.

Get *all* the facts on this $41,670 saving.

Get complete operating data showing exactly how Cook piston rings compared dollar-for-dollar with "X" brand rings. Write for the Key West Electric Story, C. Lee Cook Company, 992 South 8th Street, Louisville 3, Kentucky.



C. LEE COOK COMPANY

Rings and Packings Since 1888

took delivery of a TD 24 International dozer while Bramsfield and White received a Drott Skid-Shovel with a TD 9 International diesel from Florida-Georgia Tractor Co.

Fuel Injection Agreement

A licensing agreement to further develop, promote, and subsequently manufacture an automobile fuel injection system was announced today by American Bosch Arma Corporation and Thompson Products, Incorporated. In a joint announcement, Charles W. Perelle, president of American Bosch Arma, and J. D. Wright, president and general manager of Thompson Products of Cleveland, said the two veteran automobile equipment manufacturers now will work together in perfecting fuel injection. Thompson Products will also manufacture and market fuel injection system, under the licensing pact.

The system was developed by American Bosch Division of American Bosch Arma at its Springfield, Mass. plant. Under the agreement, the two firms will work together on future development of fuel injection systems for spark ignition type internal combustion engines, (other than aircraft), in which the automobile industry is intensely interested. Bus and truck manufacturers are also interested because of the advantages which are important to their operating costs. Perelle and Wright said one of the purposes of the agreement is to cooperate on the tooling requirements for volume production which ultimately will reduce the cost of fuel injection. Thompson engineers have been fully appraised of the American Bosch development.

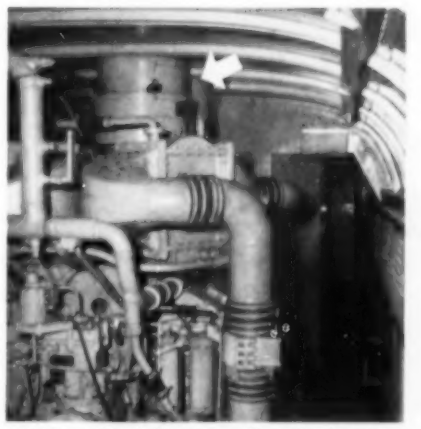
To the public, according to A. T. Colwell, Thompson vice president of engineering, research and development, fuel injection offers a means of increasing horsepower output of the automobile engine, as well as helping to eliminate the conditions which cause smog. One major contributor to smog is unburned hydrocarbon fuel coming from engine exhausts during deceleration, and this condition can be greatly alleviated by proper design of a fuel injection system. Other advantages include smoother engine performance, improved cold weather starting, and a reduction of the troublesome vapor lock problem. The new American Bosch gasoline injection system replaces the carburetor of an engine. It is not an adaptation of an existing diesel injection system, but an entirely new type, a true injection system and not a pressure carburetor.

It consists of a small and simplified fuel metering and injection pump, a fuel-air-ratio control with automatic choke, and electrically-driven fuel supply pump, injection discharge lines, atomizing nozzles and a fuel filter. By the elimination of the carburetor and the use of the fuel injection system, head room requirements in the engine compartment can be reduced by six inches to permit extensive automobile styling changes, particularly to give the driver better visibility because of lower hood lines. Perelle and Wright said the practicability of gasoline injection definitely has been established. The automobile industry is engaged in extensive testing of fuel injection.

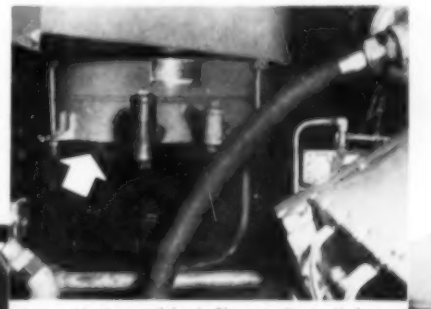
Salmon Trawler Repowered

The 40-foot *Sea Bird*, salmon trawler owned and operated by Alfred and Barney Chevalier, a father-son combination of Friday Harbor, Washington, has been repowered by a 4-51 GM Detroit diesel engine. The new diesel installed by Evans Engine and Equipment Co. of Seattle has increased the craft's cruising range and added one knot to her speed. The diesel turns a 26-in. x 20-in. wheel through 3 to 1 reduction gears to give the craft a cruising speed of eight knots.

Here's why AIR-MAZE oil bath air filters were chosen for Train-Xplorer



Air-Maze oil bath filter on auxiliary diesel engine of Train-Xplorer.



Large Air-Maze oil bath filter on Train-Xplorer main engine is readily accessible for inspection. Servicing required only at 3 or 4 month intervals.

Baldwin-Lima-Hamilton packed many innovations into the new type locomotive they built for New York Central's Train-Xplorer. Advanced, lightweight design, for one. Maybach diesel engines with hydraulic transmission, for another. Naturally, they insisted on the most advanced type of engine air filtration, too. They chose Air-Maze oil bath filters!

Why? Because from their experience with the many outstanding locomotives they've built, Baldwin-Lima-Hamilton knew that Air-Maze oil bath filters were the most effective in cutting engine wear, servicing costs and turbo-charger maintenance.

Independent laboratory tests prove that Air-Maze oil bath filters are the most efficient engine air filters used today. These tests show that the oil bath filter *stops 59% more fine Arizona road dust than the next best filtering device.* Furthermore, they maintain at least 95% efficiency *even at lowest locomotive engine speeds* and generally cost no more than competitive types of filters.

The same advantages that Air-Maze oil bath filters are giving Train-Xplorer are also rewarding dozens of other major railroads throughout the nation. If you are interested in additional facts or case histories showing how Air-Maze oil bath filters are prolonging the life of power assemblies and cutting costs, just write Air-Maze Corporation, 25000 Miles Road, Cleveland, Ohio.

The biggest names in diesels are protected by Air-Maze filters

ENGINE AIR FILTERS
CAR BODY FILTERS

AIR-MAZE

LUBE OIL FILTERS
PASSENGER CAR FILTERS

The Filter Engineers

West Coast News

By James Joseph

For San Francisco's J. A. Folger & Co., two Fairbanks-Morse model 45B4-⅛, 10½ hp diesel units.

A 6-cylinder, Model 38F5¼, 450 hp diesel engine has gone to Banco Nacional de Credito Agricola y Canadero, S.A. . . . the engine, a Fairbanks-Morse.

Opened in Los Angeles: Pacific Intermountain Express' new truck terminal, consolidating LA-area terminals. Besides quarter-mile-long tow-veyor system with 2000 pallet-carts, terminal is major PIE overhaul center (handling all power units except those used east of Denver). Terminal also becomes headquarters for this trucker's engineering facilities.

To repower a Bucyrus-Erie Model 22B shovel, a GM 3-71 power unit, sold to Bellevue, Washington's Lakeside Gravel Co.

A GM 4-51 is repowering 40-ft salmon troller "Westri", owned by Henry Peterson, Poulsbo, Wash. Diesel replaces 140 hp gasoline engine.

To Oregon State Board of Forestry, Salem, 4-cylinder, Model 48AG4½, 51¼ hp Fairbanks-Morse diesel generator.

For Seattle's Todd Shipyards Corp., two Fairbanks-Morse Model 49B4½, 84 hp (each), 4-cylinder diesel engines.

Leich Sales Corp., West Los Angeles, has taken delivery of a Fairbanks-Morse Model 38F5¼, 330 hp, 4-cylinder engine. Working a "big job" in Alaska for Contractors W. A. Smith and Brown and Root, is a 60 kw GM diesel generator set. Power plant is being installed in contractor's camp on Alaska Road Commission project.

For a new, 26-ft steel tug designed by H. C. Hanson, N.A., Seattle, a GM 6-110 diesel marine power plant. Tug's being built by Olympia's Reliable Welding Works.

To Reggies Diesel Marine Service, Newport Beach, Calif., a Fairbanks-Morse Model 45B3-⅛, 5¼ hp diesel.

Repowering the 40-ft salmon troller "Doneda", owned by Port Orchard, Washington's Donnel Hoffman, is a GM 4-51 diesel, replacing craft's 120 hp gasoline engine.

To Tempe, Arizona's Cyr and Evans, for installation in a Cedar Rapids crusher, a 300 hp Model NRT-6-I Cummins Turbodiesel, sale by Cummins Arizona Diesel Inc., Phoenix.

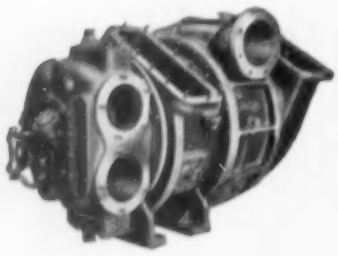
Wm. Parker, Tacoma, Wash., has repowered his 42' Owens cruiser with two GM 4-51s, reduction 1½:1. Boat has been attracting lots of attention at the Tacoma Yacht Club.

For Chimacum, Washington's Bob Allen, a 4-71 GM truck diesel, replacing his Kenworth rig's 240 hp gasoline engine. Sale by Evans Engine and Equipment Co., Inc., Seattle.

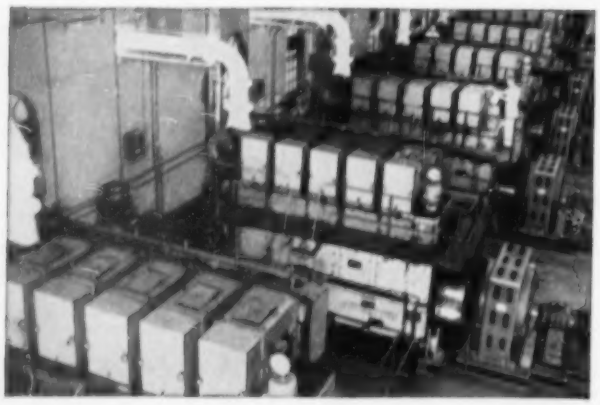
Engine Bearing Manual

A comprehensive, 100-page Mechanics' Engine Bearing Reference Manual is now being offered, free of charge, to automotive jobbers and to repair and maintenance shops by Clevite Service, The Cleveland Graphite Bronze Company, Division of Clevite Corporation.

To make the manual of maximum value as a guide and a source of useful data, emphasis has been placed on practical rather than theoretical aspects. The manual deals with performance analysis, maintenance, service, bearing



'English Electric' chose Napier Turbo-blowers



for these alternator sets



By courtesy N.S.W. Government Tourist Bureau.

which power this city

The seven 'English Electric' 5SRL Diesel alternator sets installed in the civic power station at Newcastle, N.S.W., Australia are each fitted with a Napier TS 300 turbo-blower. The power station supplies the whole of the city's power requirements. Why did 'English Electric' choose *Napier* blowers? Here are three good reasons:

- Napier blowers have *high adiabatic efficiency* resulting in low fuel consumption and maximum power increase.
- Napier blowers are backed by a world-wide service and spares organisation.
- A high standard of workmanship is guaranteed by Napier's long experience in the design and manufacture of aircraft engines and gas turbine machinery.

Napier turbo-blowers are available in seven sizes for engines of 140-5,000 h.p. afloat and ashore. Multiple installations for engines of higher powers. On 4-stroke Diesels they can double the power, on 2-strokes they increase it by over 30%—often at a lower specific fuel consumption. Napier turbo-blowers are currently in service in 69 countries.

NAPIER Turbo-blowers

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types, selection and installation as well as other related subjects. A copy of this current manual may be obtained through this publication or by writing directly to Clevite Service, 6545 Carnegie Avenue, Cleveland, Ohio.

Exhibit For Mining Show

Three new diesel models of interest to the mining industry will be included in Detroit Diesel Engine Division's exhibit at the American Mining Congress Mining Show opening in Los Angeles October 1. The new models introduced in June include four- and six-cylinder Turbopower models, the new 6-110 Roots blower engine and a 125 kw generator set. The Turbopower models offer a wider range of horsepower ratings in the Detroit Diesel line for mining equipment and through improved combustion provide increased efficiency with no increase in fuel input.

The new 6-110 diesel has a side-mounted Roots blower instead of the former rear-mounted centrifugal unit. The use of this blower, which is similar to that used on the Division's Series 71 models, provides a more compact power plant and increases the number of available accessory-drive outlets on the rear of the engine. This positive-displacement type blower also provides increased air supply to the cylinders for improved combustion. Incorporating all the improvements recently made in Detroit Diesel products, the new generator set has standby and continuous ratings that provide more kw's per dollar invested than was available in former models.

Also on display will be an engine equipped with General Motors new Hydrostarter which assures instant engine starts without the use of batteries and a fan-to-flywheel unit equipped with GM torque converter. An activated cutaway model showing how the Turbopower engine operates and a special display of over 70 scale models of mining and construction equipment which today are powered by Detroit diesel engines, completes the Division's exhibit.

Sales Manager

Cummins Diesel Michigan Inc., Michigan and Northern Ohio distributors of the Cummins diesel, have recently announced the appointment of John E. Bodkin as Sales Manager. He will be responsible for the direction and coordination of the firm's sales activities at their branches in Detroit, Grand Rapids, Michigan and Maumee, Ohio.

For ten years prior to becoming associated with Cummins, Mr. Bodkin operated his own firm of Naval Architects and Marine Engineers in Detroit. He was active in Ship Brokerage and Marine Insurance fields. During this period, he has been active in many marine engineering and promotional groups.

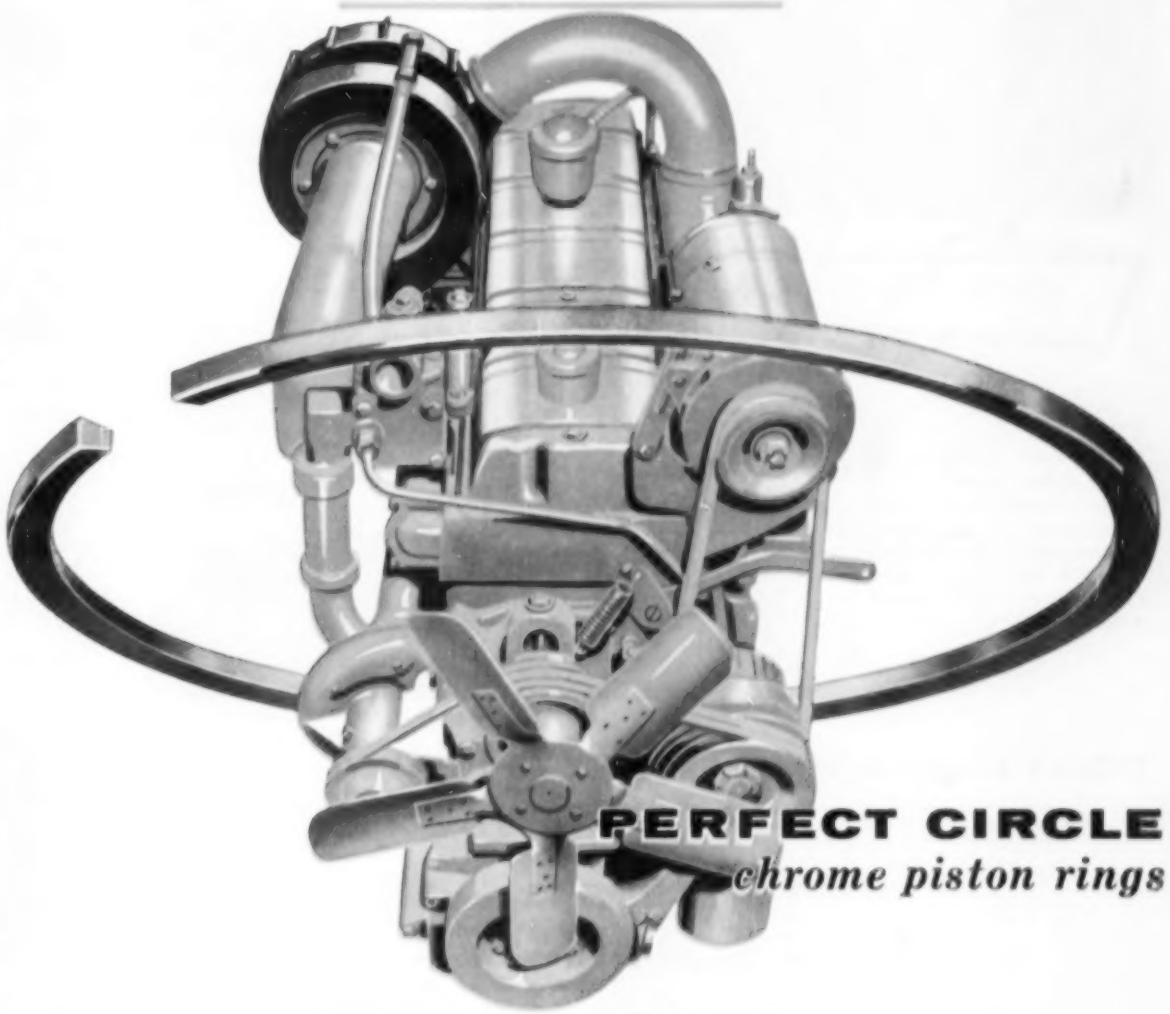
New AC Distributor

Applied Power Equipment & Manufacturing Company, Inc., 2333 Gulf Terminal Drive, Houston, Texas, is taking over the sales and servicing of Allis-Chalmers engines under the new company policy of appointing local distributors for its products. The personnel of the new sales company is the same as that formerly operating as Buda Engine & Equipment Company in Houston, and later as Buda Division, Allis-Chalmers Manufacturing Company; John Munro is president and general manager; Tom J. Howard vice president and sales director; and Wm. Dvorak secretary-treasurer; all of Applied Power, as are the former sales engineers who remain with the new organization. The company will concentrate on marine and industrial engine applications, with tractors, industrial tractors and materials handling units each under separate merchandising and servicing companies.

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PERFECT CIRCLE

chrome piston rings

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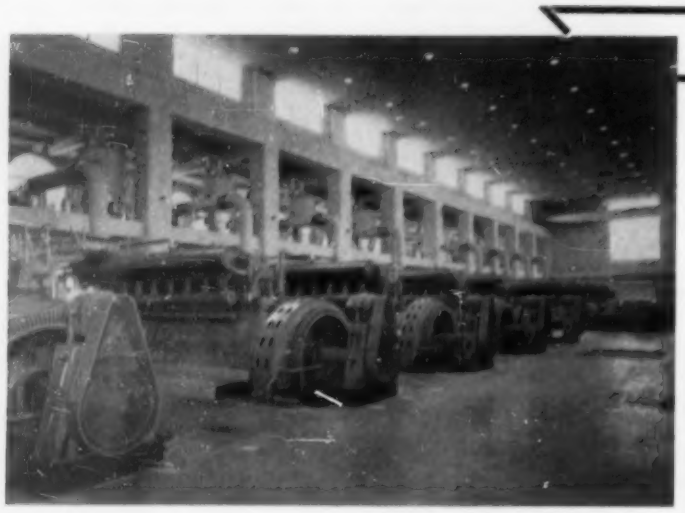
CUMMINS

DIESELS

Cummins . . . one of the leading engine manufacturers using Perfect Circle chrome rings for both original equipment and service requirements.

VAPOR PHASE COOLING PROVES ITS VALUE

ON LAND



VAPOR PHASE INSTALLATION No. 10. The nine Vapor Phase units installed in 1950, performed their jobs so efficiently for the Hyperion Sewage Treatment Plant of Los Angeles, the world's largest, that a tenth unit was added in 1954. The four-cycle engines produce a total of 16,880 hp. for plant operation. Normally wasted engine heat is also being used for heating sludge, heating the plant, and other uses—eliminating the need for boilers, heaters and heat exchangers.

ON WATER



VAPOR PHASE TAKES TO THE WATER AGAIN. Another towboat, the big "Missouri", is now enjoying the advantages of vapor phasing on its two-cycle marine diesels. It is the first diesel towboat with a Vapor-Phased fuel system designed to operate on Bunker C Fuel.

THERE'S A VAPOR PHASE PRODUCT TO HELP YOU DO A BETTER JOB:

- Steam Separators
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WRITE or wire for additional information stating your specific needs

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AN AFFILIATE OF

ST. LOUIS SHIPBUILDING & STEEL CO.

Fairbanks-Morse Appointments



V. H. Peterson



James G. Graham

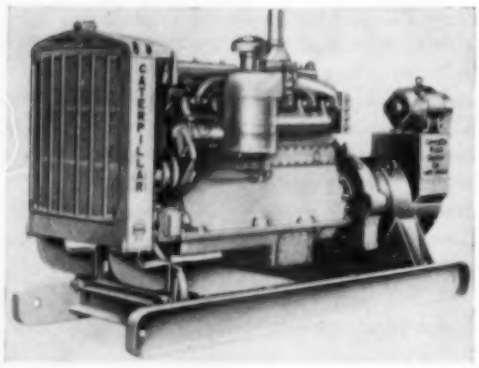


William B. Morse

Robert H. Morse, Jr., President of Fairbanks-Morse and Co., has announced important changes in some of the Company's executive positions. Mr. V. H. Peterson has been transferred from Vice President in charge of railroad sales to the position of Vice President in charge of engineering, replacing Mr. J. F. Weiffenbach, who has resigned to accept an important position with Borg Warner Corp.

James G. Graham, Eastern Regional Manager of railroad sales, has been transferred to Chicago as General Manager of railroad sales. Gordon Anderson, Jr., who had formerly been assigned to the Coordinator of Government Business office, has been assigned to the office of the Vice President in charge of engineering as Assistant Chief Engineer of the Company. William B. Morse, who was Assistant to the Chief Engineer, has been assigned to the Coordinator of Government Business office as Assistant to the Coordinator of Government Business.

Diesel Electric Set



A new 100 kw self-regulated diesel electric set has been added to the expanding line of Caterpillar-built power generating equipment, according to a recent announcement by Caterpillar Tractor Co. Known as the Cat D342 Electric Set, the new unit uses one of the highly compact new Caterpillar self-regulated generators to make available the principal advantages of previous self-regulated and externally-regulated generators in one package.

In order to assure maximum efficiency, the new generator has been designed and built specifically

to match the Cat D342 diesel engine. It features extremely close voltage regulation and in most cases is capable of filling the needs of applications now served by externally-regulated units. Voltage droop and terminal voltage can be adjusted on the new generator to meet the needs of special installations. After adjustment, the controls are locked and no further adjustments are required. The new electric set's compact size and ease of connection help to simplify installation. No elaborate switchboards or external controls are required. It is easily paralleled with other generators. Sufficient electrical capacity has been built into the new generator to give it the ability to handle the surge of heavy loads without affecting existing loads. Life of the generator is expected to match that of the D342 engine which powers it.

Twin Power For Cotton Gin



All the drive needed to operate the Stanford Gin Co's gin at Stanford, Ark., is supplied by two 180-hp International UD-24 diesel units, hooked up to one transmission. With power to spare, the installation drives three 80-saw Continental Gin stands, two 5-in. blowers, three 30-in. blowers, one 35-in. blower, a dual hydraulic bale press, precleaners, driers, and furnishes power to additional equipment as needed. The Stanford gin does custom work for farmers within a 20-mile radius, ginning 2,300 bales a year, sometimes at a rate of 40 bales a day.

Sales Manager For Southwest



William E. McCoy

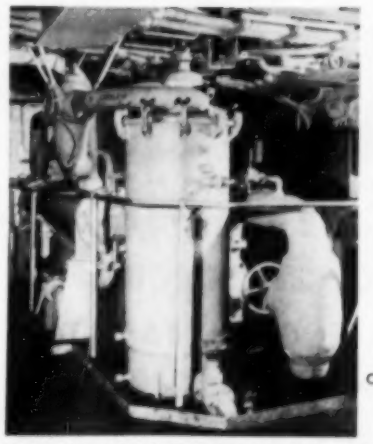
William E. McCoy has been appointed sales manager of Caterpillar's Southwest Division with headquarters in San Francisco. He succeeds Bernard L. Hagglund who died May 12. McCoy has been with Caterpiller since 1939, and during that time has served in a number of positions including assistant to the vice president of purchasing, export division credit manager, district representative in the Eastern Sales division, asst. sales manager of Central Sales division, and manager of Caterpillar's Sales Training division. He was appointed Eastern Sales division sales manager in 1955, a position he has held until his recent transfer to the San Francisco office. He is a graduate of the University of Illinois. His military record includes a tour of duty with the U. S. Navy where he attained the rank of Lieutenant.

WHY DO YOU ALMOST ALWAYS FIND THIS TRADEMARK ON THE BIGGEST AND VERY IMPORTANT INSTALLATIONS? *For instance - - - -*

Briggs

ON THE USS FORRESTAL

. . . Briggs lube oil filters are installed on their three emergency Diesel generator sets, providing power in emergencies for radar, electronic devices, fire control, elevators and other equipment.



Courtesy of Newport Shipbuilding Photo by Nixon

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over a quarter of a century of on-the-job performance has convinced marine engineers that Briggs dependability "provides that extra margin of safety." Because engineers, by actual use, know that Briggs delivers the type of fool-proof oil filtration they demand.

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THE BRIGGS FILTRATION COMPANY
WASHINGTON 16, D. C. DEPT. 120

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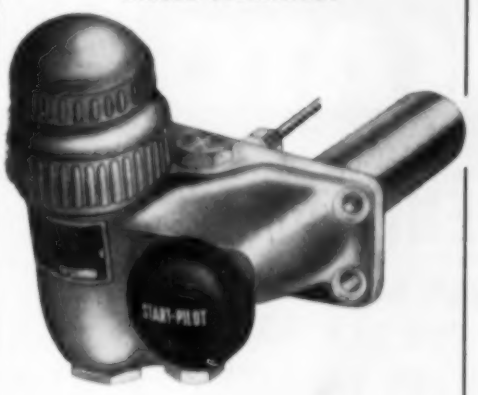
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START PILOT

. . . FOR INSTANTANEOUS DIESEL STARTING!



STARTS YOUR ENGINE AT MINUS 60°F.
SAVES UP TO 50% ENGINE WEAR

DESIGNED FOR



ALL TYPES OF



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COMPANY .....

ADDRESS .....

Gulf Coast Diesel Notes

By Michael T. Pate

Brown & Root Marine Operators, Inc Houston, have secured from Stewart & Stevenson Services, Inc., of Houston, two series 110 General Motors quad marine diesel power units, each equipped with 5:1 hydraulic reversing and reduction gear. The two 1,000 hp diesels will power the company's new 100-foot steel towboat, the "F. W. Haubert."

Bludworth Shipyard, Inc., Houston, is installing two turbo-charged Caterpillar diesels, model D397, each rated 500 hp at 1200 rpm, in a vessel under construction for Igert, Inc., Paducah, Kentucky. The craft will also have two Caterpillar D315 self-regulating diesel-electric sets, delivering 30 kw at 1200 rpm. All units were furnished by Mustang Tractor & Equipment Company, Houston.

Victoria Machine Works, Victoria, Texas, has bought from Stewart & Stevenson Services, Inc., Houston, a series 71, model 4082, four-cylinder torque converter equipped General Motors diesel, rated at 80 hp.

Societe Haitien de Minoterie S. A., Port au Prince, Haiti, represented by International Processors of Houston, has bought from Allied Power Equipment and Manufacturing Company, Houston, a model DA779 Allis-Chalmers 150 hp diesel unitized with an Allis Chalmers centrifugal pump. The unit will be shipped to Haiti for installation in a sugar *centrale*.

C. G. Glasscock Drilling Company, Corpus Christi, Texas, has bought two Stewart & Stevenson model 6GD100 diesel powered generating sets, each rated 100 kw. The diesels are series 71, 6-cylinder model 6030C General Motors engines.

Oil Well Supply Division, U. S. Steel Corporation, has bought from Waukesha Sales & Service, Inc., for the account of Brewster-Bartle Drilling Company, Houston, three model 6WAKDU 100 kw generating sets, each powered by a Waukesha diesel rated at 180 hp, at 1200 rpm. The units were furnished ready for installation on a drilling rig floor.

Gulf Coast Marine Ways, Port Aransas, Texas, has bought through Stewart & Stevenson Services, Inc., Houston, a series 110, 6-cylinder model 62203 General Motors diesel equipped with 4½:1 hydraulic reduction and reversing gear, for installation in the boat "Miss Mickie."

H. H. Null, Inc., pipeline contractor of Houston, has bought from Big 3 Welding Equipment Company, Houston, two 250-amp. Lincoln arc-welding generators, each powered by a Hercules model DIX4D diesel, rated 40. ⅝ hp continuous.

Atchafalaya Shipbuilding Company, Morgan City, Louisiana, has secured a Stewart & Stevenson 20 kw ac generator set, model 2GD20, powered by a series 71, 2-cylinder, model 2055A General Motors diesel. The unit is for auxiliary lighting use.

Farnsworth & Chambers, Inc., Houston, are repowering a Koehring dragline with a model D318 Caterpillar diesel, rated 104 hp at 1800 rpm. The diesel was furnished by Mustang Tractor & Equipment Company, Houston.

H. A Bade, Cuero, Texas, has obtained from Stewart & Stevenson Services, Inc., Houston, a series 71, 4-cylinder, model 4055A General Motors diesel, equipped with 5:6 gear drive and Watson-Spicer shaft to drive a deep well irrigation pump.

Walker-Meer Manufacturing Company, Wichita Falls, Texas, has bought three General Motors diesels from Stewart & Stevenson Services, Inc., of Houston. Two are series 71, 2-cylinder, model 2031C diesels, the third is a series 71, 3-cylinder, model 3031C. All three are of the enclosed type.

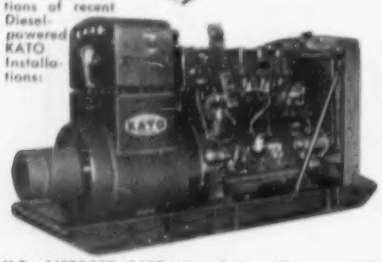
Patso Company, Houston, has bought from Applied Power Equipment & Manufacturing Company, Houston, two model DA273 Allis-Chalmers diesels unitized with centrifugal pumps. The units, rated at 50 hp each, are destined for export.

Matagorda Shell Company, Matagorda, Texas, has bought from Stewart & Stevenson Services, Inc., Houston, two series 110, 6-cylinder, model 62203 dieselized units, each embodying a hydraulic reduction and reversing gear with 1½:1 ratio. The diesels will power Captain Bob Parker's new 63-foot twin screw yacht, the "Ann-Sue."

Sheffield Steel Division, Armco Steel Corporation, Houston, is repowering a 44-ton General Electric diesel yard lo-

KATO
CONTINUOUS A.C. AND STANDBY
GENERATORS
ARE ADAPTABLE TO ALL MAKES OF ENGINES...
SIZES TO FIT ANY NEED UP TO 500 KVA

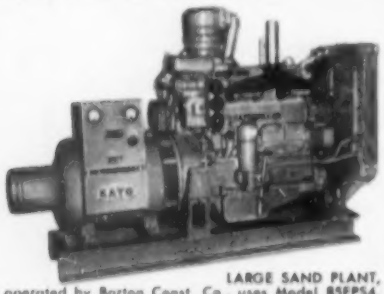
Three illustrations of recent Diesel-powered KATO Installations:



U.S. AIRFORCE BASE, Grandview, Mo. uses 75-KW, 93.8 KVA, 120/240V., 60 cycle, single phase, 1800 RPM KATO Generator, driven by P & H Harnischfeger Model 487-1B diesel engine, for emergency lighting. Sold by AAA Engine & Electricity, Kansas City.



BOEING AIRPLANE CO., Seattle, Wash., purchased 175 KW, 219 KVA, 3 phase, 3 wire, 60 cycle, 1800 RPM, revolving field type KATO Generator, General Motors Model 6240J-8A diesel engine. Installed by Star Machinery Company, Seattle.

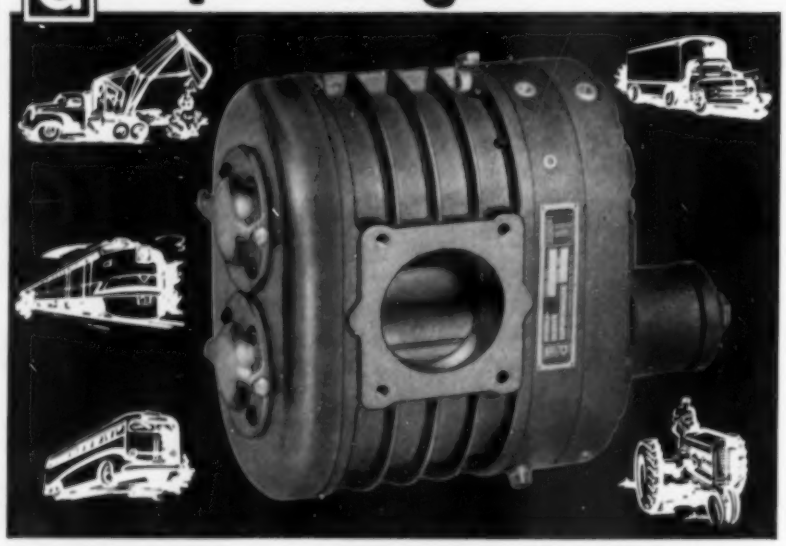


LARGE SAND PLANT, operated by Barton Const. Co., uses Model 85EPS4, 150 KW, 187 KVA, 220/440V., 3 phase, 60 cycle, 1800 RPM, 2 bearing, close coupled type KATO Generator adapted to No. 0 bell-housing on Caterpillar D337 diesel engine. Sold by Wm. H. Ziegler Co., Minneapolis.

WRITE

Builders of Fine Electrical Machinery Since 1928
KATO Engineering Company
1443 First Avenue, Mankato, Minnesota

md
DIESEL ENGINES NEED
Supercharged Power



MIEHLE-DEXTER SUPER-CHARGERS
INCREASE HORSEPOWER, TORQUE, ACCELERATE YOUR ENGINES FASTER

Wherever Diesel engines work—buses, tractors, trucks—a Miehle-Dexter Supercharger adds a big boost to performance. Power is increased by the simple addition of this compact, space-saving supercharger. That means *extra* speed at any load, *extra* pushing or pulling power at any speed, wider speed range. More, it means faster acceleration with less smoke. Add all this to engines without increasing size, weight or cost. In fact, weight per horsepower is decreased. Standard M-D models available for most engine applications. For more facts, call or write Miehle-Dexter.

Soon available AN ENTIRELY NEW TYPE OF TURBOCHARGER

MIEHLE md DEXTER
Supercharger Division
Dexter Folder Company
113 Fourth St., Racine, Wisconsin

comotive with a model D17000 Caterpillar diesel, rated 190 hp at 1000 rpm. The diesel was furnished by Mustang Tractor & Equipment Company, Houston.

Collins Construction Company, Port Lavaca, Texas, has obtained from Stewart & Stevenson Services, Inc., Houston, a series 71, 4-cylinder, model 4082 General Motors diesel to repower a 3-drum hoist. The diesel is rated 80 hp.

C. F. Martin Well Servicing Company, New Iberia, Louisiana, has bought from Waukesha Sales & Service, Inc., Houston, a model 6WAKDU Waukesha diesel, rated 180 hp at 1200, to power a well-servicing rig.

T. & N. O. Railroad, Southern Pacific Lines, Houston, has bought from Stewart & Stevenson Services, Inc., Houston, a series 71, 3-cylinder, model 3082 torque-converter equipped 60 hp General Motors diesel to repower an American locomotive yard crane.

Pioneer Centrifuging, Limited, Houston, has bought from Waukesha Sales & Service, Inc., of Houston, a model 195DLCU Waukesha diesel rated 76 hp at 2000 rpm to be used to drive one of the company's centrifuge machines for mud-desanding.

Pure Oil Company, Houston, has bought through Stewart & Stevenson Services, Inc., a pumping unit, mounted on a steel base, which consists of a 3x4 Mission centrifugal pump and a series 71, 2-cylinder, series 2031C General Motors diesel. The diesel is rated 40 hp.

Continental Supply Company, Dallas, has bought from Mustang Tractor & Equipment Company, Houston, a model D315 Caterpillar diesel, rated 70 hp at 1800 rpm, which will be used to drive a Walker-Meer unit.

Oilwell Supply Division, U. S. Steel Corporation, Houston, has bought from Stewart & Stevenson Services, Inc., Houston, a series 71, 4-cylinder, model 4030C General Motors open type diesel to power an Oilwell 5-10T mud-mixing pump for Brewster Bartle Drilling Company. A second similar unit, except model 4031C, and furnished enclosed, was also bought. The open type will be used under cover, the enclosed unit out in the open at the mud pit.

Robert H. Ray Company, Houston, has bought for export a mobile Stewart & Stevenson 20 kw model 2GD20 diesel-electric generating set. The 20 kw ac generator is driven by a series 71, 2-cylinder, model 2030C General Motors diesel. The entire unit is enclosed and mounted on a two-wheeled, rubber-tired trailer. This is the fourth such order placed by the Ray Company.

DiaLog Company, Houston, through Hall's Auto Supply Company, Houston, has bought a series 71, 3-cylinder, series 3031C closed type General Motors diesel which will be used to power one of the DiaLog company's well surveying units.

Higman Towing Company, Orange, Texas, has bought through McIntosh Electric Supply Company, two model DA779 Allis-Chalmers diesels, rated 150 hp each, to be installed by the company to drive barge cargo pumps. The diesels were furnished by Applied Power Equipment & Manufacturing Company, Houston.

Diesel For Trucks

Four Wheel Drive Auto Company, which recently introduced a new transport tractor featuring a Deutz V-8 air-cooled diesel engine, now is offering the Deutz powerplant on FWD 32,000 through 40,000-pound four-wheel-drive trucks and 36,000 through 40,000-pound six-wheel-drive units for all FWD markets. "The 170 net horsepower rating and high torque range of the Deutz air-cooled diesel make the engine especially adaptable for FWD's heavy-duty trucks in oilfield, logging, utility, construction, and road maintenance markets," said G. F. DeCoursin, FWD vice president-sales, in announcing availability of the Deutz engine in FWD's 300 and 400 Series trucks.

The Deutz F8L614 diesel has a 4.33-in. bore, 5.51-in. stroke, 640-in. piston displacement, and a maximum torque of 448 lbs ft at 1,200 rpm. Because of the engine's lugging power at lower speeds, it is possible to utilize the Deutz engine on FWDs with a five-speed transmission. FWDs with Deutz powerplants can pick up speed and move the load at 1200 to 1300 rpm in all types of operation. Combination of FWD's torque-proportioning, fully-compensating center differential with the Deutz air-cooled diesel engine is resulting not only in fuel economy but in tire economy as well.

In addition, FWD's torque-proportioned four-wheel-drive, with engine torque divided 50-50 or ⅓-⅔ between front and rear driving axles, and six-wheel-drive, with engine torque proportioned one-fifth to the front driving axle and two-fifths to each axle of the rear driving tandem, results in maximum usable traction and load-ability. In the Deutz V-8 engine design being utilized on the FWD trucks, heat of the air-cooled engine is carried away directly by the cooling air forced into the V-shaped space between the two rows of cylinders inclined toward the outside. Each cylinder is provided with air guide plates which guarantee the best flow of cooling air. The axial blower, used to force cooling air through the engine, is driven by gears from the camshaft drive and the amount of air necessary for good cooling is regulated automatically by the increasing revolutions of the crankshaft.

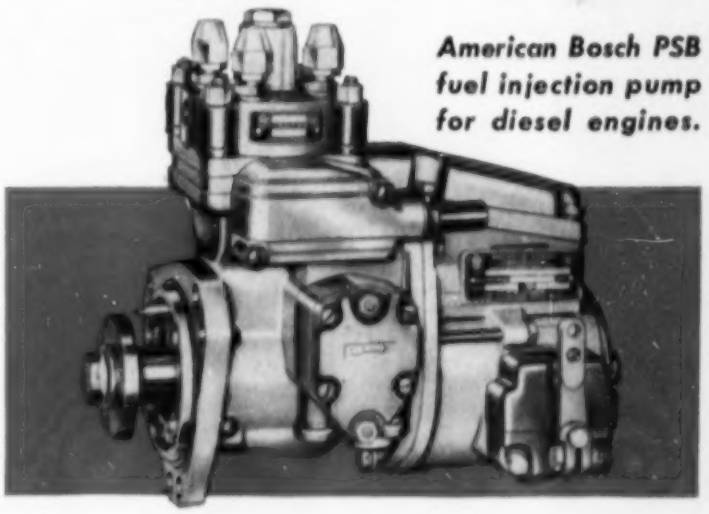
Department Heads

Five appointments to department head positions at the Aurora Plant of Caterpillar Tractor Co. have been announced by C. A. Woodley, vice president. They are: Harold M. Schafer, Manufacturing Manager; Jerry J. Sheehan, Employee Relations Manager; William T. Gabbett, Purchasing Agent; Ivan J. Fleener, Chief Accountant; and Louis G. Frank, Chief Engineer.

Mr. Schafer has had more than 15 years of manufacturing experience with Caterpillar, and has been manager of tooling since 1954. Starting with the Company in 1941, Mr. Sheehan has been personnel director of the Peoria Plant since 1953. Mr. Gabbett has had nearly 14 years of experience in various office services and purchasing assignments at Peoria. Chief Accountant of the Company's plant in York, Pa. since 1952, Mr. Fleener has been in accounting since 1943. Mr. Frank has been Chief Engineer of Trackson Company in Milwaukee, a subsidiary of Caterpillar, since 1951. He joined Trackson in 1929.

NOW AVAILABLE! The Completely new Volume 21 of **DIESEL ENGINE CATALOG.** This giant, fully illustrated reference book containing complete and detailed engine and accessory sections is bigger, better than ever before. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company order forms to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, California.

American Bosch PSB fuel injection pump for diesel engines.



Unmatched for service and performance . . .

That's the record of more than 100,000 American Bosch PSB fuel injection pumps now in service—some for as long as five years. The PSB has many features—simple rugged construction, fewer parts, accurate fuel metering and distribution, positive governor control. Easily replaceable hydraulic head permits quick field servicing. All combine to assure top engine performance and economy of operation, long trouble-free life and *low* maintenance expense.

Every American Bosch fuel injection product is backed by an established and growing system of authorized service agencies, fully equipped and staffed with trained personnel to provide quick, efficient repair service.

AMERICAN BOSCH
Division of
American Bosch Arma Corporation
Springfield 7, Mass., U. S. A.

4096

Manifold Alignment Device

When the surface of the heads on an overhead valve engine have been machined any appreciable amount, the manifold bolt holes and ports will not line up correctly. It is then necessary to machine the intake manifold surface of the head a precise amount to insure proper alignment. It is reported that an instrument designed by Leonard Connett, of Piston Ring Service Company, of New Orleans, Louisiana, will quickly determine the necessary amount to machine from the manifold surface of the head. The head manifold device shows the correct amount simply and mathematically correct regardless of the year, model or kind of engine head. Merely place one edge of the device on the head surface and the other edge on the intake manifold surface of the head. The factor indicated by the device, is multiplied by the amount cut off the head to determine the amount to cut off the manifold surface of the head for perfect alignment. The correct amount depends on the angle between the head surface and manifold surface. The head manifold device is guaranteed to be mathematically correct. List price is $8.00. For further information, write Piston Ring Service Company, 800 Baronne Street, New Orleans 13, Louisiana. ITS NEW

Sales Engineer Appointed

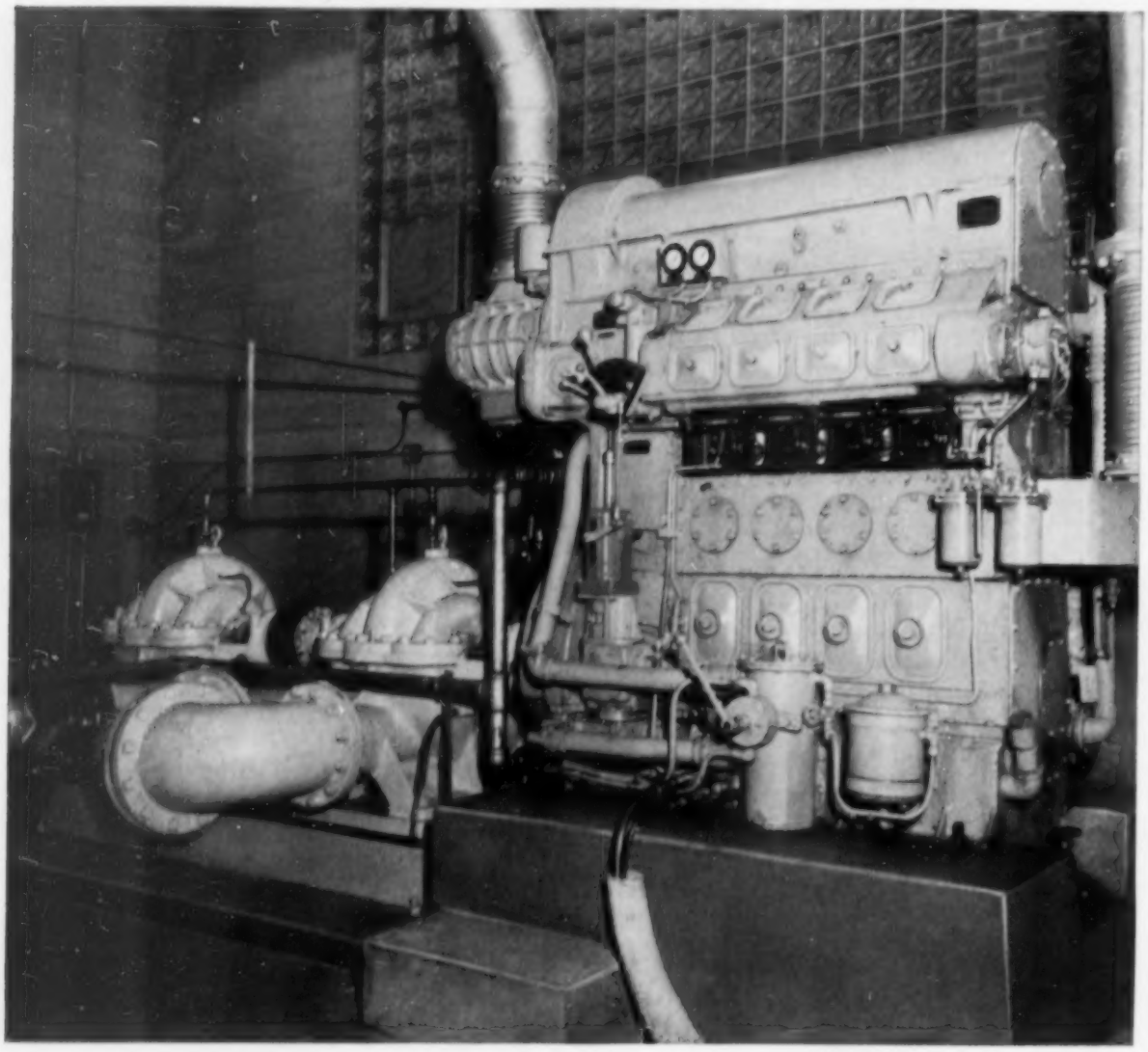
The appointment of James M. Canaris to its sales-engineering staff has been announced by J. H. Nash, Vice President and General Manager of The Briggs Filtration Company, Washington, D.C. For the past eleven years, Mr. Canaris was an officer of the Lofstrand Company, Rockville, Maryland, serving as Vice President in Charge of Engineering. Prior to this, he was associated with The Briggs Filtration Company, where his duties were principally analysis and review of data pertaining to oil filtration equipment used in conjunction with aircraft, marine, stationary and automobile engines, both gasoline and diesel.

Four Sport Fishing Vessels

The Grandy Boat Company has delivered four 42-ft x 14-ft Sports Fishing vessels for service at Westport, Washington. These boats, built by Grandy Boat Company, were designed by Edwin Monk with the sport fishing charter service in mind and are being acclaimed among the Charter Services as an ideal boat, well suited to meet the growing demand for deep sea sports fishing and the forerunner of a growing fleet of such boats. A large and unobstructed after deck, together with open side and for'd decks, gives ample room for the playing of a hooked fish, while a pipe railing completely enclosing all decks adds the safety feature so important. Although designed primarily to give the sportsman every convenience while fishing, the comfort of the fisherman has not been overlooked and the boat offers a large pilot house with foam rubber cushioned dinette, white enameled oil range, sink, running water, toilet room and two berths forward.

The four boats delivered to date are: The *Frank L II*, owned by Frank L. Lambertsen and powered with a Cummins HRM 600 diesel: The *Fleetfisher*, owned by Harry L. Lewis and powered with the General Motors Series 71 diesel, The *Sea King*, owned by Leo J. Bordeaux and powered with the General Motors Series 71 diesel: The *Sea Crest*, owned by Arion Lewis Jr. and powered with a General Motors Series 71 diesel.

Some sort of dubious honor attaches to the fellow who sets a non-stop endurance record of diesel operation until he goes a little too far and the engine goes the road of the One Ho'se Chaise.



FAIRBANKS-MORSE TEAM

Cuts Pumping Costs in Half

Power costs at Canandaigua, New York, were running $24.68 for a million gallons of water pumped. Then a Fairbanks-Morse team of 300 horsepower Opposed-Piston diesel and two 10" centrifugal pumps took over and made a power savings of 51%.

Originally installed as a standby unit, the Opposed-Piston diesel engine produced such obvious economies that it soon was scheduled for a major part of plant pumping—providing power to pump as high as two million gallons a day in the summer. The 10" centrifugals operate in series and, though designed for 2500 g.p.m., they consistently average 2800 g.p.m. at a net head of 304'.

F-M engineering that matches power and pump can bring economy and increased efficiency to your specific pumping problem. Write for details on the type and size of pump you need—there are more than 50,000 models in the F-M pump line. And there's a "working model" of the Opposed-Piston engine contained in Bulletin No. AOX-350.15, waiting for your request. Fairbanks, Morse & Co., Dept. DP-9, Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES · DIESEL LOCOMOTIVES · RAIL CARS · ELECTRICAL MACHINERY · PUMPS · SCALES · HOME WATER SERVICE EQUIPMENT · MOWERS · MAGNETOS

Director of Development

Robert W. Beal has been named Director of Development at the Corps of Engineers Research and Development Laboratories, Fort Belvoir, Va. In the newly-created position, Mr. Beal, formerly chief of the Laboratories' Mechanical Engineering Department, will be responsible for the establishment of an effective applications engineering program designed to bridge the gap between research and development and the quantity production of new Corps of Engineers military equipment.

He will also serve as consultant to Laboratories' Director, Col. H. F. Sykes, Jr., and the installations' Technical Director, Dr. George W. Howard. An employee of the Engineer Laboratories since 1946, the new Director of Development served as an Engineer officer more than five years during World War II, first with a construction battalion in the Southwest Pacific, and later as an instructor in military construction procedures at The Engineer School at Belvoir.

He was graduated from Oregon State College with a B. S. in Mechanical Engineering in 1936, and at that time was commissioned a second lieutenant in the Corps of Engineers Reserve. An assistant professor in the Engineering Division at Iowa State College from 1936 to 1941, Mr. Beal received his master's degree in mechanics from that institution in 1937 and continued graduate work toward his doctorate until called for military service in 1941. A native of Parkdale, Oregon, he is married to the former Eleanor Halliday of that town, and they have three children. The Beals now reside at 46 Fairhaven Avenue, Alexandria, Va.

New Type Valve

U. S. Valve Corporation, 831 Bond Street, Elizabeth 4, New Jersey announces the availability of a new leak-proof valve which employs a newly developed plastic seal of outstanding durability to achieve a permanent leak-proof quality. Ideally suited for application in industry or in the home—wherever leak-proof valves are vitally necessary in the control of fluids, such as water, oil or gasoline, and gases, such as acetylene, propane, butane or coal gases, this newly developed valve assures leak-proof performance through thorough field testing under the most critical conditions, according to the manufacturer. More than 100,000 of these units are currently being used in the European mining industry.

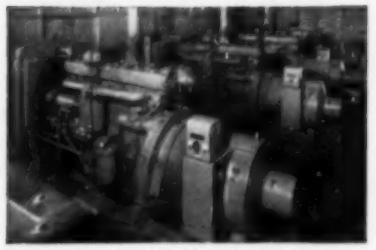
This new valve remains completely leak-proof under pressure of 725 lbs/sq in. It permits no drop in line pressure. The gate of this valve has a straight cylindrical hole which, when the valve is opened, is in line with the opening in the valve body—therefore, there is no restriction of the movement of the flowing fluid or gas. One-quarter turn is all that is necessary to open or close the valve. No maintenance or lubrication is required after installation. This new leak-proof valve has a working pressure of up to 435 lbs/sq in. It can be tested at pressures of up to 725 lbs.

It is designed to operate at temperatures of up to 250°F. The new plastic seal has a shore hardness of 80. Additional data can be obtained from the U. S. Valve Corporation, 831 Bond Street, Elizabeth 4, N. J. (ITS NEW)

NOW AVAILABLE! The Completely new Volume 21 of **DIESEL ENGINE CATALOG.** This giant, fully illustrated reference book containing complete and detailed engine and accessory sections is bigger, better than ever before. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Orders are being accepted for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company order forms to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, California.

E-M "Packaged" Generator *Bulletin*

"ON-THE-SPOT" POWER WHEN YOU NEED IT

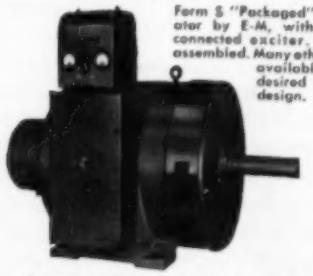


These "vest pocket" auxiliary power plants are operated by a large refining company. Such plants, comprising a diesel engine and a 100 kw E-M "Packaged" Generator, produce high-quality voltage right on the spot, for needs such as lighting, controls, communications, and even large pump motor starting and operation.

E-M "Packaged" Generators supply constant voltage automatically... dependably

● Simple, trouble-free, and dependable ... these E-M "packaged" units are *complete*. Generator, exciter, control, and all necessary components are integrated into one compact housing, ready to install and easy to connect. And no special switchboards or operating skills required!

Built-in voltage regulators assure a steady output whether generators are operated singly or in parallel. When load varies, voltage output is quickly returned to desired level.



Form S "Packaged" Generator by E-M, with direct-connected exciter. Factory assembled. Many other types available to fit desired engine design.

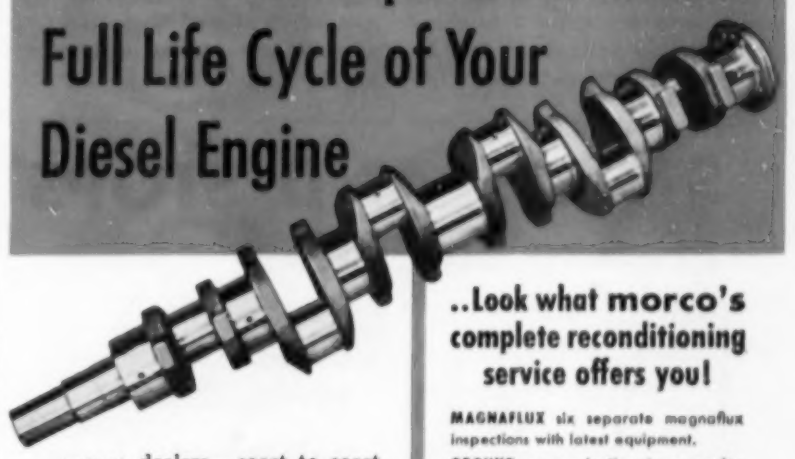
Sturdy E-M construction plus a minimum of moving parts gives you long service with only routine maintenance. Ratings to 187 kva, in speeds of 900 to 1800 rpm. Ask your nearest E-M sales engineer for more facts, and write for publications listed below.

ELECTRIC MACHINERY MFG. CO.
MINNEAPOLIS 13, MINNESOTA

Send for these informative brochures:

☐ "The A-B-C's of 'Packaged' Generators"
☐ E-M Synchronizer No. 35, Generator Issue
(2100-TPA-2147)

morco Factory-Certified Exchange Crankshafts give Trouble-Free Operation for the Full Life Cycle of Your Diesel Engine



morco dealers—coast to coast—are stocked with reconditioned, like-new crankshafts for different diesel engine models. Users of Detroit Diesel and Cummins engines can exchange worn shafts for MORCO factory-reconditioned shafts through authorized dealers.

Why take chances? Let your dealer be your source for dependable, safe crankshaft regrinding. You get immediate service, guaranteed quality and terrific economy. Ask your dealer about MORCO today.

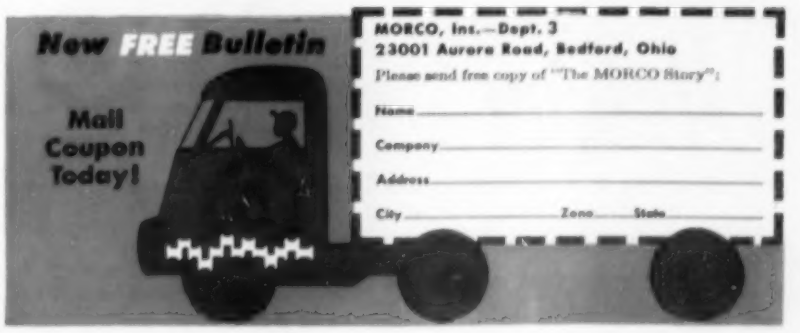
..Look what morco's complete reconditioning service offers you!

MAGNAFLUX six separate magnaflux inspections with latest equipment.
GROUND on production type equipment to engine manufacturers' specifications. Original stroke retained.
TOCCO* HARDENED by the original equipment method when necessary.
ROLLED FILLETS increase strength of the most critical areas.
DYNAMIC BALANCE restored on original factory balancing equipment.
THRUST COLLARS and surfaces restored.
GEAR FITS renewed.
KEY WAYS restored.
DOWEL HOLES repaired.
OIL SEAL surfaces renewed.
THREADS repaired.

*TOCCO is a registered trademark of the Ohio Crankshaft Co.

morco INC.
BEDFORD, OHIO

a subsidiary of
The Ohio Crankshaft Company



Michigan–Ohio News

By Jim Brown

The City of Detroit has announced plans to purchase a "modern, dieselized" fire boat. Their present equipment is an oil-fired steam plant and is proving to be prohibitively expensive to operate. We hear that present plans are to take bids from marine architects.

Pittsburgh, Pennsylvania is to have a new diesel fire boat in a few months. Paasch Shipbuilders of Erie, Pennsylvania is building it. It will carry two 6-110 GM Detroit diesel pumping engines, supplied by Highway Equipment Company of Pittsburgh.

Michigan Limestone Company of Rogers City, Michigan has taken delivery of two TD-24 International Harvester tractors from Wolverine Tractor and Equipment Company, I. H. Distributors of Detroit and Grand Rapids, Michigan, for use in a large quarry.

Received from Michigan Tractor and Machinery Co., Caterpillar Sales Agency in Detroit, announcement of the addition of a new Service Building, giving them a total of 12,500 square feet of service area in Detroit in addition to 2,600 square feet of service area under roof at Grand Rapids. The new Detroit Service Building is located directly behind their former Sales and Service building.

National Refiners Division of Ashland Oil Company has installed a new 600 cfm Chicago Pneumatic compressor powered by a GM Detroit 6-71 diesel, at Findlay, Ohio.

Cummins dieselized trucks added recently to the Farmington Transportation Company (Farmington, Michigan) fleet include 10 used Macks with Cummins NHB600, 200 hp engines and 6 new Autocars with 200 and 250 hp Cummins diesel engines.

The Tri-county Trucking Company of Oak Park, Michigan recently added 6 new Macks to their fleet, each with a Cummins NHB600 engine and 3 250-hp Cummins-powered Autocars.

Million-dollar road-building contracts don't "grow on trees" but one was recently awarded to A. Lindberg and Sons and Thornton Construction, of Ishpeming and Hancock, Michigan, respectively, for 8.9 miles of state highway in Ontonagon county in the upper peninsula of Michigan. Their successful bid was $904,998—five other bids, all of over $1,000,000, were offered. Where roads grow, diesels go.

On its first job- constructing an outdoor movie theatre near Wayne, Michigan, a Galion 118 diesel motor grader has proven very helpful to F. F. Burnash of Flint, Michigan.

Wolverine Tractor and Equipment Company also sold a Galion T-600 Motor Grader to the Clinton County Road Commission.

We're told by the Worthington Sales Office in Detroit that a 2000-hp, turbocharged, SW 14-8 Worthington diesel generator is being readied for installation for the City of Petoskey at Petoskey, Michigan this fall. A 450 rpm, 8-cylinder in-line engine will drive an Electric Machinery, 1750 kw generator. Consulting (post-order) Engineers on the installation, which will include all accessories and switch gear, are Cummins and Barnard of Ann Arbor, Michigan.

W. E. Phillips Equipment Company of Detroit recently sold to Galloway Excavating Company of Berkeley, Michigan, a model 255A P & H ¾ yard backhoe with a P & H 3-cylinder, 80 bhp at 1250 rpm, 2-cycle diesel engine. Mr. Galloway, a P & H owner for 3 years, is pleased with the preformance of this new backhoe on basements and other excavating work.

Holloway Construction Co. of Livonia, Michigan has added two new Caterpillar D9 tractors and a 1-yard Link-Belt Speeder (LS98) shovel to their equipment for the Charlotte, Michigan road relocation project. One of the D9 "Cats" will be equipped with a ATECO Hydraulic ripper and will be ripping up *18 miles* of old concrete highway. Quite a project.

Holloway Construction Company also took delivery this summer on two 955 model Caterpillar Traxcavators from Michigan Tractor and Machinery Company.

Wolverine Tractor and Equipment Company of Detroit and Grand Rapids reports having sold a Galion T-500 power-shift road grader to Iosco County Road Commission.

A Warner and Swasey Gradall model 2460 with a 3031 GM Detroit Diesel engine has been delivered to A. E. O'Black of Unity, Pennsylvania by Conte Equipment Co. of Pittsburgh.

An International Harvester TD-24 tractor has been delivered to Glime Construction Company of Hazel Park, Michigan by the Detroit branch of Wolverine Tractor and Equipment Company.

To keep bright the lights at its new Eastland shopping center, the J. L. Hudson Company of Detroit has chosen an HRIS600, 125 kw Cummins standby generator set, with completely automatic starting which will cause it to "cut in" in any necessity.

The Presque Isle Corporation, of Alpena, Michigan, supplier of limestone to several large steel companies, has added to the already considerable number of Cummins-powered vehicles in their quarrying fleet 5 new Euclid 46-TDS 22-ton rear dumps with Cummins 300 hp NHRBIS600 diesel engines under the bonnets, according to Cummins Diesel Michigan Inc.

F. J. McGraw Co. of Hannibal, Ohio has accepted delivery of a Jaeger 600 cfm compressor, powered by a 6-71 GM Detroit diesel engine which has received its initial servicing and inspection from Ray C. Call Company of Steubenville, Ohio.

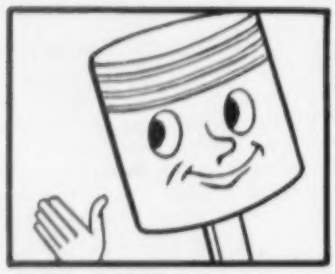
Sugden and Sivier of Oak Park, Michigan have a lot of diesel equipment at work on a relocation of U. S. 16 west of Detroit, including 2 D9 Caterpillar tractors and a new D8.

McLain Construction Co. of Lansing, Michigan have two new Caterpillar DW-21 scrapers at this writing, with two more on order, all from Michigan Tractor and Machinery Co., Caterpiller Distributors.

Great Lakes Diesel of Cleveland, Ohio will service the 3-71 GM Detroit diesel in a Buffalo-Springfield road roller purchased by J. A. Jones Construction Company of Charlotte, N. C. for use in Mansfield, Ohio. The roller was sold by the E. F. Craven Company of Greensboro, N. C.

Another piece of equipment coming into Great Lakes Diesel's territory is a Clark Equipment Company model C-16 excavator sold by J. J. Turner, Inc., of Cleveland to the City of Youngstown,

STARTS AND STOPS
. . . sure and safe



By Cecil Diesel
ROVING REPORTER

KANKAKEE, ILL.—A power shovel dumps the final load of rumbling stone into the last car. The train is loaded. A shout from the rear, then the International UD-1091 diesel



hums louder. The locomotive eases the train to a roll . . . hauls the heavy load of stone on a quick trip from quarry to crusher . . . brakes to a steady, sure stop.

I ask the engineer, "How'd you start and stop so smooth with that heavy load?"

"Easy," he says. "Compressed air operates sander and brakes — and this air is furnished by a QUINCY Compressor." Lehigh Stone Company has found it can rely on its

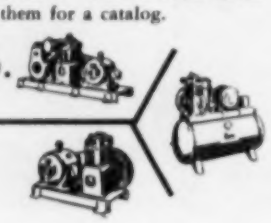


Model 340 Quincy Compressor . . . for a supply of air that's always there.

And there's a Quincy Compressor to fit every diesel requirement — including horn blowing and engine starting. Let Quincy help you select the right model from a range of mountings and sizes — from 1 to 90 CFM. Write them for a catalog.

Quincy COMPRESSORS

QUINCY COMPRESSOR CO.
DEPT. K-51, QUINCY, ILLINOIS



World's finest air compressors

Ohio, Water Dept. Great Lakes Diesel was there to see that the "Jimmy" Diesel got off to a good start.

The City of Grand Rapids, Michigan has taken delivery on a TD-18 International Harvester tractor from Wolverine Tractor Company and will use it in general maintenance work.

C. J. Rogers, Inc. of Detroit has recently put to work two new "Cat" D4 tractors and two D8s- the latter with torque-converter drive.

Michigan Tractor and Machinery Company, Caterpillar Distributors, are converting an old steam railroad crane to Caterpillar diesel in their service yard for Jones Iron and Metal Company of Detroit.

Not one, but *two* International Harvester TD-14 tractors were delivered recently by Wolverine Tractor and Equipment Company of Detroit and Grand Rapids, Michigan to Mike's Excavating of Alpena, Michigan. Looks like Mike has a lot of digging to do.

Peninsular Diesel of Detroit will service the 4080 Torque-Converter GM Detroit diesel in a Thew L50K6 shovel sold to Fair-Way Equipment Co. of Detroit by the W. H. Anderson Co., prominent Detroit Construction Equipment vendors.

A. M. Thompson, in his Northville, Michigan gravel pit, is breaking in a new Bucyrus-Erie 22B dragline with an International Harvester diesel engine, sold by Wolverine Tractor and Equipment Company. Area west of Northville is blessed with deep gravel deposits and is the scene of great activity and much diesel equipment.

Offshore Platform

R. G. LeTourneau, Inc., has signed to build a $3¼-million offshore drilling platform for Zapata Off-Shore Co. of Houston, with delivery scheduled for early 1957. This portable drilling platform is the second to be built by LeTourneau. The first, also constructed for Zapata, currently is drilling its second well in the Gulf of Mexico. The new platform will be somewhat larger than the first and will incorporate a number of improvements. LeTourneau will build the platform at riverside construction facilities on the Mississippi near its Vicksburg (Miss.) Plant. Upon completion about Feb. 1, the platform will be floated 400 miles down river and out into the Gulf.

In operation, the machine will lower its legs to the bottom of the Gulf and, within a two-hour period, will have elevated its deck to the height of a 10-story building above the ocean's floor. Upon completion of the well, it will lower itself to the water, lift its 145 ft legs, and then proceed to its next location. Mr. LeTourneau revealed that complete outfittting, including all drilling equipment required for the platform will be installed by his firm. The platform, which will have an operating weight of 8,000,000 lbs, will be triangular in shape and will be raised and lowered on three 145 ft legs. These legs, which are engineering feats in themselves, will be of open-truss construction to better withstand wind and wave forces. On top of one leg will be a helicopter landing area, surrounded by a safety net.

Located at all three corners of each triangular leg will be long vertical gear racks, to which will be geared powerful electric motors. In operation, these gear-motors (nine per leg) will force the legs up or down, and also will hold the platform in place at any desired height. At the base of each leg will be a gigantic tank, 35 ft across and 32 ft deep, which will serve as feet for the platform. The bottoms will be cup-shaped to better grip the ocean's floor. Also there will be facilities to force jet streams of water into these cup-shaped areas to help free the feet from mud and sand after a well is completed. The deck will be 194 ft long and 152 ft wide, or well over half an acre in area. Located here will be housing accomodations for a 45-man crew, areas for storing drill pipe and other supplies, two deck-mounted LeTourneau revolving cranes with 300 ft/ton capacities and 80 ft booms, and three LeTourneau anchor windlasses.

Powering the electric elevating system, and also supplying ships service power for the platform, will be LeTourneau-built generators driven by three 600 hp diesel engines. A separate set of engines will furnish power for mud pumps, drawworks and other drilling machinery. Interior of the 20 ft-deep hull will house much of the drilling equipment as well as the diesel engines, generators, and various supplies. Compartments have been designed to hold 1,000 barrels of drinkable water, 5,000 barrels of drilling water, 1,000 barrels of diesel oil, 1,500 barrels of active drilling mud, and 10,000 sacks of dry drilling mud. Fully loaded, the 4,000-ton drilling platform will have a draft of only 11½ ft.

Improving Valve Life

Applying a protective aluminum-iron alloy layer to the working faces of internal-combustion-engine valves extends their life to from two to three times that of a conventional valve made of the same material, according to a recent ASME paper. Increased oxidation resistance provided by the alloy layer results primarily from the formation of aluminum and complex iron–aluminum oxides that provide a protective film which inhibits further attack on the base metal. The problems involved in experimentation and research to find an economical way of applying this coating were disclosed to engineers attending the semiannual meeting of The American Society of Mechanical Engineers. The paper was prepared by J. A. Newton and M. D. Braid, Valve Division, Thompson Products, Inc., Cleveland.

After various uneconomical trial arrangements involving heating the valve in a fluxing salt, dipping it in molten aluminum and passing it through an air blast to remove the excess, a final process design was evolved that produces quality parts on an economical basis. It consists of degreasing, induction pre-heating to 400 degrees F, aluminum spraying, induction post-heating to 1400 degrees F to form the alloy film, and final inspection. Since the final induction heating affects the entire valve head, the high temperature causes a slight distortion. In answer to this problem, the authors plan the use of radio-frequency heating in the last stage of the process. By this method only the outside periphery of the valve will be heated, and distortion will therefore be kept to a minimum. Copies of the paper, No. 56-SA-35, can be obtained at 50 cents each from Order Dept., ASME, 29 W. 39th St., New York 18, N. Y.

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Years ago, the burro was used for carrying and dumping loads in mines and similar territory. Today, the Scoot-Crete powered with Deutz diesels has taken his place. One man can load, drive and dump a Scoot-Crete, carrying loads up to 3500 lbs at speeds up to 12 to 15 mph. Scoot-Crete, with caster steering, turns in its own length for easy maneuverability. Heavy duty tires provide a sure grip on any surface, indoors and outdoors. With drive wheels located directly under the load, Scoot-Crete has the power for climbing grades up to 25% and for consistent performance under varied conditions. The locking brake lever holds the Scoot-Crete positively immobile. It is ruggedly built, with forward and reverse speeds, with air-cooled Deutz diesel engine, for use inside, outside and underground. The Scoot-Crete is built by Getman Brothers in South Haven, Michigan.

New Power Take-Off

The Twin Disc Clutch Company, Racine, Wisconsin, announces the addition of a new model to its SP Line of heavy-duty friction power take-offs—the SP-321. The SP Line was designed specifically to meet the increased power transmission requirements of today's higher speed, higher horsepower industrial engines. Unusually compact for its high capacity, this new power take-off can handle up to 6730 lbs-ft of torque and transmit up to 602 hp at 1550 rpm. It's available with a standard SAE No. 00 flywheel housing adapter to meet the widest range of industrial power units in its hp and rpm ratings.

Other features include a triple drivingplate construction to provide ample friction surfaces to withstand excessive heat—a pilot bearing with double-width bearing race for greater lubrication retention and long life—and a spherical roller bearing at the clutch output shaft for a greater overload and side-pull capacity. For complete information, write Twin Disc Clutch Company, Racine, Wisconsin. Request new Bulletin 308.

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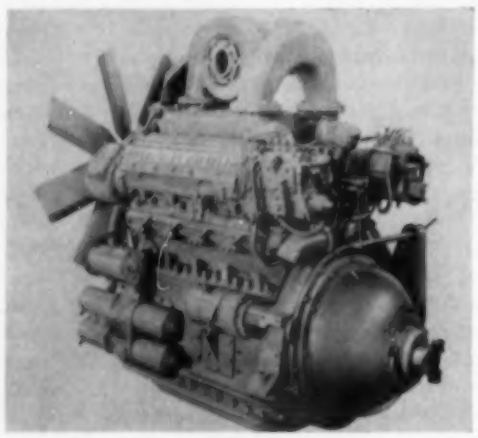
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AP 174-755

Hercules Turbocharged Diesels



Hercules TCD-1468 V type 8 cylinder diesel developing 520 hp at 2000 rpm.

Hercules Motors Corporation, Canton, Ohio now offers three series of turbo-charged diesels. These compact and economical power plants are designated the TCD series engines. Various models of these TCD's have been in service since 1950. The applications have included busses, generator sets, mine cars, marine applications and other specialized equipment where compact power is very important.

The TCD-501 is a 6-cylinder model, has a 4½" bore x 5¼" stroke and produces 178 hp @ 2000 rpm. The TCD-501 has a 48 $\frac{9}{16}$" length fan-to-flywheel. An important feature of this model is that the turbo-charger may be positioned to fit the particular application. The TCD-895 is also a 6-cylinder engine but with a 5 $\frac{5}{8}$" bore x 6" stroke and develops 320 hp @ 2000 rpm. The TCD-895 has a 62" length fan-to-flywheel. The turbo-charger on this model may also be positioned to fit the particular application. The TCD-1468 is an 8-cylinder Vee type model and has a 6¼" bore x 6" stroke. The TCD-1468 develops 520 hp @ 2000 rpm and is only 59 $\frac{7}{16}$" long from fan-to-flywheel. The turbo-charger is located in the Vee. The TCD-1468 is now being

used in many different types of service. Communication equipment, oil field service and the marine industry are some of the fields utilizing this compact and dependable diesel. (ITS NEW)

Dallas Branch Manager



R. F. Bartlett

The promotion of R. F. (Tad) Bartlett to Branch Manager of the Dallas Branch by A. A. Burrell, Vice President and Southwestern District Manager, has been announced by Robert F. Lay, Vice President and General Sales Manager of the Cooper-Bessemer Corporation. Under the new field office organization plan, Mr. Bartlett will be responsible for supervision of the Dallas Branch area activities on direct sales, engineering, and service contacts in the application of reciprocating and centrifugal compressors for pipe line, refinery and petrochemical use.

As manager of the Dallas Branch, Mr. Bartlett will be under the supervision of the District management, comprising A. A. Burrell, Vice President and Southwestern District Manager, and C. H. Sanders, Assistant Southwestern District Manager. Under this new organizational plan, Mr. Bartlett will assume the responsibilities of the Dallas branch operations, and Mr. Burrell and Mr. Sanders will be able to follow more closely the needs of rapidly expanding industry in the Southwest district.

A graduate in Mechnical Engineering from Texas A & M, Mr. Bartlett has been associated with Cooper-Bessemer since 1934 in the field application of engines and compressors. He was an Army Reserve Officer from 1933 to 1951, serving in active duty from March, 1941 to April, 1946. Mr. Bartlett is a member of the Engineer's Club of Dallas. Cooper-Bessemer's Dallas Branch and Southwest District Management Offices are located at 1318 Fidelity Union Life Building, Dallas 1, Texas.

Ground Support Unit



Atlas, one of America's most promising ballistic missiles, is under construction by Convair, a Division of General Dynamics Corporation. Although the Atlas uses its own power source and controls during flight, trained personnel and exacting ground support form an important part of the missile's success. Caterpillar Mobile Electric Sets, similar to units supporting B-47 and B-52 Aircraft, compose a segment of this ground support. Each unit employs a Caterpillar D375 diesel engine operating at 1200 rpm, driving a Marathon 256/440 volt, 3 phase, 60 cycle, 150 kw generator. Switch-gear for the unit is made by Eseco. The trailer mounted electric set is weatherproof, completely enclosed, and capable of operating under adverse temperatures as low as minus 65° F. The generator set incorporates features which allow both local and remote control of frequency and voltage, with constant voltage supplied within the limits of plus or minus 1% over the entire operating range. On full load application the unit recovers in 2.2 seconds to within 1% of rated voltage. On load rejection the unit recovers in 2.7 seconds to within 1% of rated voltage.

Although the Atlas' operating characteristics are classified, much equipment used in conjunction is commercial in nature—except for minor modifications. It is significant that American Manufacturers are aiding and meeting the requirements of the Nation's Defense Program.

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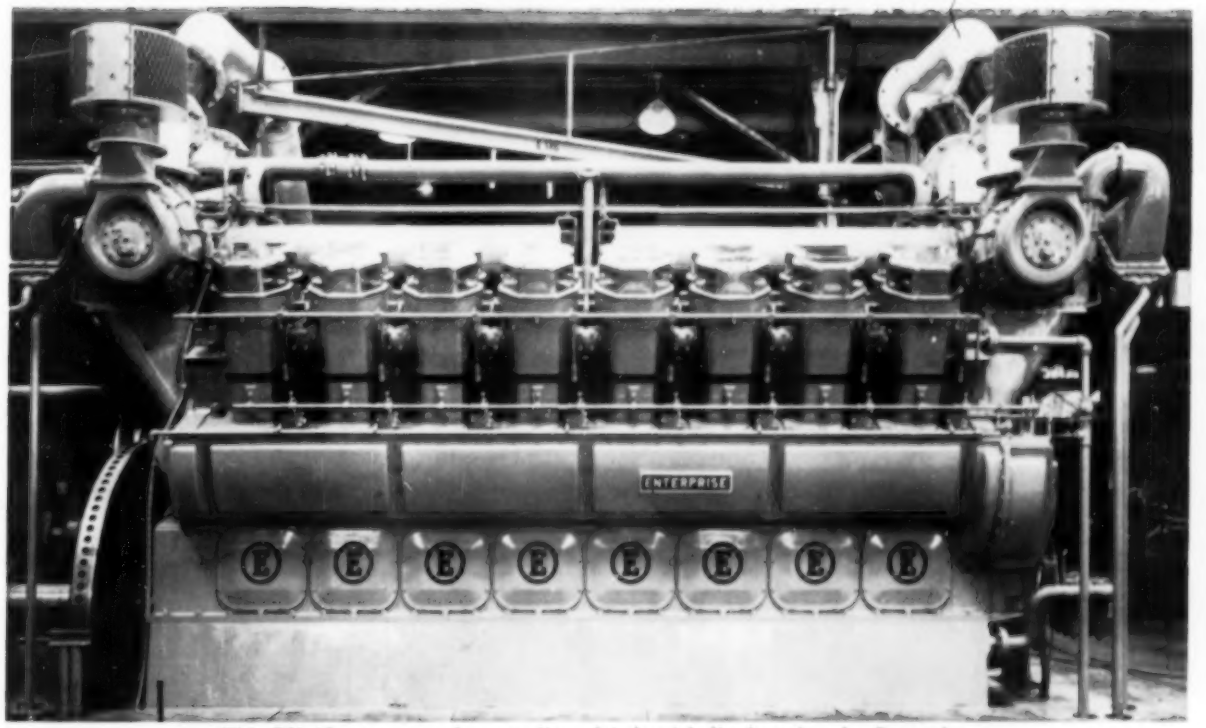
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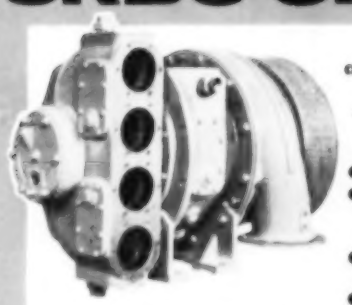
This RV 16, prototype of a new line of industrial diesel engines by Enterprise Engine & Machinery Co., San Francisco, was sold to the government of Saudi Arabia. It has a verified rating of 7,700 HP at 600 rpm, measuring 26'2" long, 9'4" wide, 12'1" high, weighing 189,000 lbs. It is equipped with four Brown Boveri VTR 320 turbo-chargers.

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